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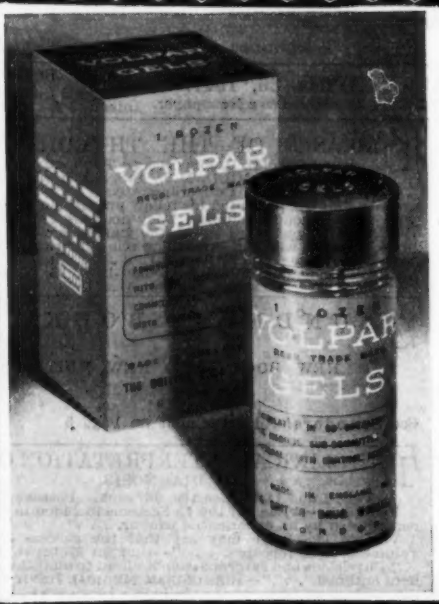

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ORIGINAL ARTICLES

THE LYMPHATIC PATHWAY FOR ABSORPTION FROM THE NASOPHARYNX*

BY J. M. YOFFEY, M.Sc., M.D. Manc., F.R.C.S.
LECTURER IN ANATOMY, UNIVERSITY COLLEGE OF SOUTH WALES AND MONMOUTHSHIRE, CARDIFF

WHILE we are all of us familiar with the presence of lymphatics and lymph nodes in the neck—since enlargement of these nodes presents us with one of the classical problems of differential diagnosis—it is only of recent years that we have come to appreciate the existence of definite functional lymphatic pathways, comprising both vessels and nodes. The concept of a functional pathway has been worked out particularly in the case of the deep cervical lymphatics, which have been studied from their origin in the nasopharyngeal mucosa to their drainage into the great veins. The deep cervical lymphatics commence in the mucous membrane of the nose, accessory air sinuses, and pharynx as a rich capillary plexus (Yoffey and Drinker 1939a), whose vessels drain finally into the deep cervical lymph-duct. The deep cervical lymph-duct—which will be called, for the sake of brevity, the cervical duct—is just as constant in its occurrence as the common carotid and the internal jugular vein, close to which it lies as it passes down the neck. The cervical duct usually empties on the left side into the thoracic duct, on the right side into the right lymph-duct; though several minor variations are possible, the important fact is that at the root of the neck the cervical duct empties into the blood-stream.

The cervical duct, before finally reaching the great veins, passes through one or more lymph-nodes. In the cat (fig. 1) and dog the course of the lymph, as it passes from the nasopharynx to the blood, is interrupted by a single large node, the deep cervical node. In the monkey (fig. 2) and in man the cervical duct passes through a chain of five or six nodes (Yoffey and Drinker 1938). It may be noted that this difference between the lymph-nodes of monkey and man on the one hand, and lower mammals on the other, is not confined to the cervical nodes. In other regions also one finds the single large lymph-node replaced by a chain of smaller nodes.

The demonstration of the deep cervical pathway is extremely simple. In an anæsthetised animal, a solution of a vital dye is dropped into each nostril, and the animal then left alone for two hours or more. T-1824, an isomer of trypan blue, was found to be most suitable, for it is deeply coloured even in high dilutions; in the cat 1 c.cm. of a 5% solution of T-1824 in normal saline should be dropped into each nostril. On dissecting the side of the neck, the pathway is now found to stand out sharply. The dye has passed through the nasal mucosa and the walls of the submucosal lymphatic capillaries, whose lymph it now stains. In the cat, for instance, one can see a number of lymphatics from the nose and pharynx converging to the deep cervical node, and from the posterior border of the node the single deep cervical duct takes origin and proceeds downwards in the neck. Both duct and node are deeply coloured by the dye, and the entire pathway stands out with diagrammatic clearness. The method delineates a living and functioning system of vessels while actually at work, and is free from the disadvantages of the interstitial injection methods previously employed.

ABSORPTION OF DYES

The simple experiment just described demonstrates the absorption of dye through the normal nasal mucosa. For a more detailed study of the phenomenon it is necessary first of all to tie a cannula into the cervical duct. When the duct is cannulated, there may be a spontaneous flow of lymph, clear, with a faint tinge of yellow; lymph usually flows spontaneously in the monkey, and presumably, therefore, in man. In the absence of a spontaneous flow, gentle massage of the duct empties its lymph into the cannula, after which the duct fills up again and the procedure may be repeated. Occasionally the flow of lymph is negligible; no satisfactory explanation has yet been offered for this occasional "dryness." If, in an animal whose cervical duct has been cannulated, one then instils into the nose the solution of T-1824, the dye quickly passes through the mucous membrane and enters the lymph. It appears in the cannula within 20–30 min. in the monkey, cat, and rabbit, rather longer in the dog, in concentrations which are weak at first but subsequently undergo progressive increase until a fairly constant level is reached. Only a few minutes are required for the passage of the dye through the nasal mucosa, but there is some delay before it reaches the cannula, for to do so it must traverse the entire cervical pathway and displace the normal lymph previously present in it. It may further be noted that some dye, after passing through the mucous membrane, is absorbed directly into the blood-stream. In this and succeeding experiments the appearance of any substances in the cannula tied into the cervical duct means that in the intact animal such substances would also have been passing into the blood, for the duct was invariably cannulated low down in the neck, immediately before entering the great veins.

ABSORPTION OF PROTEINS

When it had been shown that T-1824 passed so readily through the nasal mucous membrane and entered the lymph-stream, attention was directed to the possible absorption of still larger molecules. Egg albumin, with a molecular weight of 34,500 (Svedberg and Nichols 1926), was found to traverse the nasal mucosa and enter the lymph-stream just as readily as T-1824, with a molecular weight of 960. Serum albumin, with a molecular weight of $72{,}000 \pm 3000$, was only occasionally found in the lymph-stream after nasal instillation (Yoffey, Sullivan and Drinker 1938). Horse serum dropped into the nose was never detected either in lymph or blood. Here, of course, one is dealing with a mixture of serum albumin and serum globulin, the latter with a molecular weight in the neighbourhood of 175,000 (Adair and Robinson 1930). The fact that the nasal mucosa would let through T-1824, but not horse serum, suggested its use as a biological dialysing membrane. Gregersen and Gibson (1937) had suggested that T-1824 in the blood combines in some way with the plasma proteins—a point of some importance in connexion with the use of T-1824 in estimating blood-volume. Since T-1824 in aqueous solution readily passes through the nasal mucosa, whereas horse serum does not, it seemed reasonable to suppose that by using a solution of T-1824 in horse serum this hypothesis could be put to the test. When employing a 5% solution of T-1824 in horse serum, a small amount of dye appeared in the lymph, though very much less than when using a solution of equal strength in normal saline. With a 1% solution of T-1824 in horse serum no dye whatever appeared in the lymph, whereas with a solution of the same strength in saline the dye came through quite freely. These observations support the view that T-1824 combines with the blood proteins, but suggest also that in the case of the 5% solution there was a slight excess of the dye which did not combine, and that it was only this excess which passed through the nasal mucosa. In the 1% solution, on the other hand, practically all the dye was combined with the serum and consequently none came through.

As far as proteins are concerned, two problems present themselves from a clinical standpoint. First, can sufficient foreign protein be absorbed either to induce a state of hypersensitiveness, or if such a state is already present, to bring on anaphylactic shock? From some unpublished experiments performed by myself and E. R. Sullivan in 1939 it was found impossible to induce anaphylactic shock by dropping protein into the noses of sensitised guineapigs. At the same time it is by no means out of the question that clinically there may be some individuals in whom the absorptive power of the nasal mucosa is increased to an extent sufficient to give rise to allergic phenomena. As pointed out by Drinker

* A Hunterian lecture delivered before the Royal College of Surgeons of England on Jan. 29, 1941.

(1940), however, most of the experiments in which results were claimed to follow absorption from the nose were actually inhalation experiments in which the whole of the respiratory apparatus was involved, and the sites of possible absorption ranged from the nasal sinuses to the pulmonary alveoli. Secondly, the absorption of proteins from the nose also has a bearing on the question of immunisation by nasal instillation of toxins and antitoxins. As far as size of molecule is concerned, the limit of absorbability seems to be represented by serum albumin, with a molecular weight of 72,000±3000, but it is absorbed irregularly and in small amount. In the case of diphtheria, where repeated attempts have been made to immunise by the nasal route, the toxin has a molecular weight of 70,000, and the antitoxin 150,000 (Pappenheimer et al. 1940). If molecular size is the sole determining factor, it seems likely that toxin would be absorbed, but that antitoxin would not, and that furthermore toxin would be absorbed only on a small scale. However, in the case of toxin the size of the molecule may not be the only factor, and there is always the possibility that the toxin might act on the nasal mucosa and the underlying lymphatics in such a way as significantly to increase their permeability.

ABSORPTION OF VIRUSES AND BACTERIA

Viruses are very much larger than any of the protein molecules so far discussed, and one would hardly expect, therefore, that they would pass directly through the nasal mucosa. Using one of the larger viruses (vaccinia) this was found to be the case (Yoffey and Sullivan 1939). In neither monkeys, cat, nor rabbits could virus be detected in the cervical lymph within 9 hours after being placed in the nose. However in rabbits virus was almost constantly found in cervical lymph from 12 hours to 7 days after nasal instillation. The position is complicated by the fact that one is not dealing here simply with the passage of particles, but of particles which are capable of multiplication and direct extension through the mucosa, and apparently during the first 12 hours the virus is establishing itself and multiplying in the nasal mucosa, which becomes reddened and hyperæmic.

In all these experiments the cervical duct was cannulated low down in the neck, after it had passed through

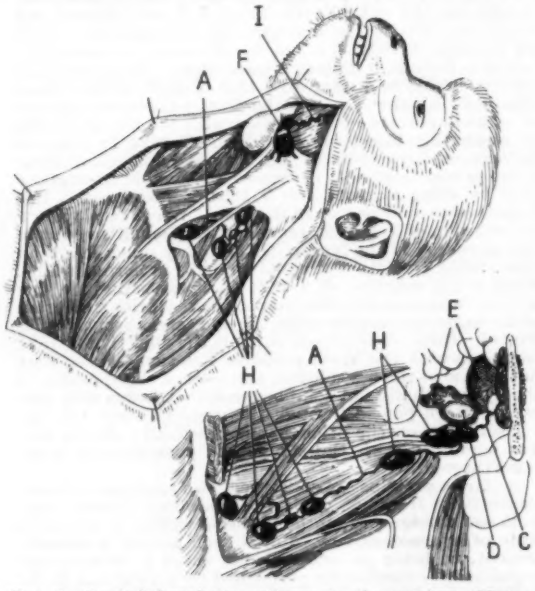

FIG. 2—Cervical lymphatic pathway in the monkey (*Macaca mulatta*) after nasal instillation of T-1824. Above, superficial dissection; below, deep dissection. A, cervical lymph-duct. C, afferent vessels to highest node of the cervical chain. D, tonsil. E, patches of mucous membrane. F, a superficial cervical node. H, chain of deep cervical nodes. I, superficial lymph-vessel running from cheek and angle of mouth, over surface of masseter, into superficial cervical node. (The figures are redrawn from Yoffey and Drinker 1938.)

lymph-nodes, and immediately before entering the blood. In the intact animal, therefore, the virus would have been passing from the primary focus in the nasopharynx to the blood-stream, in which it would be distributed throughout the body. Furthermore, the lymph-node through which the virus has passed does not appreciably

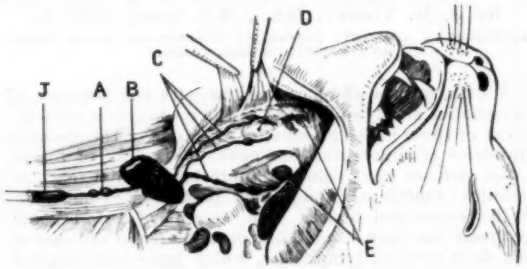

FIG. 1—Cervical lymphatic pathway in the cat, as seen after nasal instillation of 5% T-1824. A, cervical lymph-duct. B, cervical lymph-node to which nasopharyngeal lymphatics are converging, and from which the cervical duct takes origin. C, afferent vessels to single cervical lymph-node. D, tonsil; this does not stain, though the mucous membrane all round does. E, patches of mucous membrane through which dye can be seen in mouth and pharynx. J, cannula in cervical lymph-duct.

retard or prevent such passage. The mechanism whereby virus passes through the node without any difficulty depends upon two factors. The first is that viruses are cytotropic, and become attached to living cells if in contact with them; in the present instance the predominant cell in the lymph-node is the small lymphocyte. The second is that lymphocytes are continually leaving lymph-nodes in large numbers. It follows that virus leaving a node is in the lymphocytes, and not in the fluid part of the efferent lymph. This can readily be shown by centrifuging such lymph at a speed just sufficient to throw down the lymphocytes. It will then be found that the supernatant fluid is free of virus, which is contained entirely in the cell sediment (Yoffey and Sullivan 1939).

It thus appears that we must reconsider the traditional view, first formulated by Virchow, that the chief function of lymph-nodes is to act as barriers to noxious particles in the lymph-stream and prevent them from reaching the blood. This may be partially true of inert particles and bacteria, though even here it is open to criticism (Drinker and Yoffey 1941). But in the case of a virus such as that of vaccinia the lymph-node, far from preventing the spread of infection, actually encourages it. Virus reaches the node, multiples there (McMaster and Kidd 1937), and then leaves it and is carried to the blood-stream by the lymphocytes in the efferent lymph.

The fixation of the virus by the lymphocyte introduces further complications. First, the virus may be protected in its passage through body fluids against any neutralising principle which they may contain (Rous et al. 1935). Secondly, since the lymphocyte can migrate through the walls of the capillaries, virus which has entered the blood-stream can leave it in all parts of the body, and the finding of vaccinia virus in any given tissue becomes explicable by blood transmission, though this does not, of course, exclude the possibility of other modes of spread. Thirdly, one of the most striking pathological changes in so many virus diseases is the perivascular accumulation of lymphocytes. This is usually interpreted as reaction to the virus. It is an intriguing speculation that this may be confusing cause with effect, and that the accumulation of virus-carrying lymphocytes may be responsible for the first introduction of virus into the affected region.

One must not generalise too hastily, from these vaccinia experiments, that all virus diseases have a similar mode of spread. "The nasopharynx provides the portal of entry for some of the most common of virus diseases, familiar examples being measles, the common cold, smallpox, chickenpox, and poliomyelitis" (Gordon 1940). In some experiments with the virus of poliomyelitis, where the disease was induced by the intranasal instillation of virus, virus was never detected in cervical lymph,

nor in lymph-nodes (Yoffey and Drinker 1939b.). It is possible that poliomyelitis may be so specifically neurotropic that the virus will not flourish in other than nervous tissue. It has also been shown that in such cases the virus is present in the nasal mucosa for only a short time (Sabin and Olitsky 1938), and it may be that virus would be found in the lymph if the latter were collected at the right moment, when there was virus in the mucosa. Apart from specific tropisms, for any virus disease which spreads in the same way as vaccinia (virus from local lesion → regional lymph-nodes → lymphocytes in efferent lymph → blood) it is an essential corollary that virus be present in the blood-stream, primarily in the lymphocytes but secondarily in the other white cells also. It is of interest that the presence of virus in the blood, limited to the white blood-cells, has in fact been noted in a number of virus diseases.

Only further experiment will show whether other virus diseases spread in the same way as vaccinia. The virus of vaccinia, by reason of the frequency with which it is used in ordinary Jennerian vaccination, occupies a sufficiently important position clinically for the facts above presented concerning its mode of spread to be significant in themselves. It seems more than probable that in ordinary vaccination virus does not remain confined to the site of the original lesion or lesions, but passes to the regional lymph-nodes and from there becomes disseminated throughout the body. If the virus employed happens to have developed neurotropic tendencies, a post-vaccination encephalitis may be expected to ensue. The problem in such cases is not how the virus reaches the central nervous system, but why it has become neurotropic.

ABSORPTION OF BACTERIA

When we come to consider the absorption of bacteria we have the same general problem as was presented by the viruses. Particle size is not the only determining factor, for one is dealing with particles which can multiply in a susceptible host. The susceptibility of the host is, in fact, the most important factor to be considered. Thus the rabbit is particularly susceptible to the type III pneumococcus. It is not surprising, therefore, that Schulz, Warren, and Drinker (1938) noted that type III pneumococci, instilled into the nose of rabbits, could often be found within an hour in the cervical lymph. On the other hand, in similar experiments with dogs, where enormous numbers of virulent pneumococci were dropped into the nose, none were ever detected in the cervical lymph. In the rabbit experiments of Schulz and his colleagues the pneumococci seemed to pass through the deep cervical node without too much difficulty. Whether less virulent organisms would have passed through the lymph-node also we are unable to say at present. From the point of view of the barrier theory of lymph-node function, it is perhaps more important that lymph-nodes should hold up virulent rather than avirulent bacteria, or rather the lymph-nodes should hold up all kinds of bacteria. The experimental observation that some if not all bacteria can pass through nodes indicates a somewhat imperfect barrier function. The question is part of the wider problem of the defensive function of the lymphatic apparatus generally (Drinker and Yoffey 1941).

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EFFORT SYNDROME

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OF every ten patients admitted to cardiac hospitals in the last war, nine were suffering from functional disorders, most commonly effort syndrome (Lewis 1940). This disorder is characterised by disproportionate breathlessness and fatigue on effort, and a varying degree of undue disturbance of the pulse-rate on exercise (abnormal exercise-tolerance test). There may also be dizziness or fainting attacks, blurred vision, thoracic pain of the left inframammary type, palpitation and tachycardia, indigestion and constipation, headaches, insomnia and nightmares, "nervousness," undue sweating, tremor, cramps and numbness of the limbs. The diagnosis is made on the presence of these physiological and psychological symptoms in the absence of adequate or relevant physical signs. Experience shows that soldiers suffering from effort syndrome, unless in mild instances, are unfit for military service. There is little tendency to spontaneous improvement and methods of treatment so far employed, though temporarily beneficial in some cases, have failed almost completely in restoring fitness for full service.

The known facts about effort syndrome collected during and after the last war have been recorded by Lewis (1940), Fraser (1940), and Grant (1940). Unanimity has not been reached as to ætiology. Some authors attribute it mainly to infection, exotoxic and endotoxic influences. The existence of emotional factors in some cases is generally admitted (Lewis 1940, Oppenheimer and Rothschild 1918, 1919). Because it occurs in emotionally maladjusted people some believe it to be an emotional disorder (Culpin 1916). The following investigation, undertaken by psychologists in collaboration with physicians, was intended to assess the relative significance of the various ætiological factors encountered.

METHOD

This study is of 50 unselected soldiers, aged 20–54, with clear-cut effort syndrome. Patients with evidence of thyroid dysfunction were excluded. The existing cardiac lesions in 3 soldiers did not account for their symptoms. The great majority were under thirty at the onset; 17 were seen less than a year, 17 less than five years after the onset of their symptoms; 6 gave a history of symptoms lasting over sixteen years, 4 a history dating from the last war. Of the total of 50, 40 were privates, 8 N.C.O.s and 2 officers. More than half (27) were territorials or had volunteered since the beginning of the war; 3 were regulars, 8 reservists, and 12 conscripts. In their civil life, 15 were sedentary, 35 manual workers; 29 had noticed their first symptoms in civil life, 10 during non-combatant service abroad, 4 after fighting experiences and 1 while in hospital.

After a complete cardiological investigation, the patients were submitted to a 3–6 hour psychological examination covering the whole life-history. Special attention was paid to their psychological characteristics as children. A verbatim report of the interview with each patient has been kept.

Breathlessness, which was universally present, was the most frequent symptom; dizziness, cardiac pain, palpitation, headache, nervousness, sleeplessness, undue sweating, tremor, fatigue while at rest, indigestion, nightmares, cramps, numbness, fainting, constipation and blurring of sight followed in that order. Breathlessness, cardiac pain, palpitation and fatigue are, as a rule, complained of only after the patient has made some very slight effort, but in a few cases these symptoms existed even when the patient was at rest. Some patients wake up with a start at night, feel themselves to be suffocating, and have cardiac pain and palpitation. Some had nightmares which took the form of battle dreams. Sensations in the chest were sometimes described as a vague

discomfort in one or other side, but more often as a sharp pain, "like the stab of a knife," in the præcordium. Many of the patients complained of a feeling of fluttering in the chest, as if the heart was going to stop or burst; this was usually accompanied by a fear of impending death. Apart from fatigue on exertion, many patients had general lassitude, often more noticeable in the morning. They often said, "I have no go in me," or "everything is too much for me." In 21 of the 50 patients breathlessness was the presenting symptom; in the others the presenting symptoms in the order of frequency were cardiac pain, palpitation, fatigue, nervousness, headache, dizziness and trembling.

PERSONALITY TYPES

Mathematical examination of childhood characteristics, following a method described previously, enabled us to detect a significant frequency of certain personality types.

Group 1.—This group was made up of 20 men, characterised by an unusually keen sense of duty which obviously arose from a rigid superficial and deep morality (George Washington, Calvin and Quaker types). The sons of fathers who had usually been hard workers, teetotallers, devout Christians and strict disciplinarians, and of loving, sweet-tempered mothers, often described as "saints," most of these soldiers grew up in an austere atmosphere, in which a severe sense of duty, a rigid morality and a high standard of self-regard were fostered. Many of them were more serious-minded than other children; they took their home-work very seriously, never "larked" in the streets, and in their spare time would often spontaneously give their parents a "regular helping-hand in the house." Dominated by an undue sense of obligation towards their parents, they were obedient to the point of submissiveness, never told lies, felt unduly guilty about minor lapses, and if they had done something which, according to their standards, was wrong, they were anxious to own up. None of them "liked a good scrap" and most of them would have "walked a mile rather than get mixed up in a fight." On the other hand, many of them liked watching fights and some of them could stick up for themselves if attacked. Many of them described themselves as solitary and reserved, preferring study to rough games. None of them were leaders or performers; if forced into the limelight they felt uneasy and blushed. For example, one of the patients said "If people praised me I felt rotten about it." Most of these patients indignantly denied being nervous as children. Most of them enjoyed school life. The desire to be top boy was prevalent in all of them and many of them achieved it. One of them, typically, was ostracised at school, because he kept out of a scrape and was afterwards held up as an example by the headmaster.

Nearly all of them were retarded in their sexual development, and early sexual feelings had aroused an unusual sense of guilt. They were shy in the presence of girls, and usually married the first one their shyness allowed them to approach. In their occupations they were industrious and efficient routine workers; whatever they did they did to the best of their ability. Those who gave them a character often described them as sober, reliable, honest and trustworthy. Their perfectionistic tendencies are expressed in the motto of one of them: "Near enough is not good enough." Confronted by a task they suffered from unjustified feelings of imcompetence, and afterwards worried unduly as to whether they had done it well. Once started they would never abandon anything unfinished, and in their anxiety often checked their work several times over. If they had nothing to do they felt restless and unsettled, and would often undertake unnecessary jobs to keep themselves occupied. One patient said "If I have nothing to do I rearrange my house." They avoided the minor indulgences of life; 12 of the 20 were strict teetotallers, 6 very moderate drinkers; only 1 drank excessively. They had little interest in sexual matters and never deviated from the straight and narrow path. Many were religious and spent their spare time in theological studies. One typical patient took prizes for scripture at school, wanted to be an evangelist in adolescence, and as an adult not only attended the services of the Church of England, of which he was a member, but also those of Welsh, Scottish and Jewish denominations.

Socially, and in the Army, their main characteristics helped them to get on well with others, but priggishness gave rise to difficulties in some cases.

Group 2.—Although similar to group 1 in their over-conscientiousness and rigid moral code, the 11 members of this group were less repressed in their aggressiveness and were characterised by a deep-seated attitude of resentment, obviously arising from experiences of early childhood. Most of them had had an unhappy childhood (in 2 examples despite spoiling and pampering). Many described their fathers as dogmatic, intolerant, ill-tempered or definitely brutish and often gave a life-long history of frequent clashes with such parents. Mingled with a manifest admiring attachment to a mother who had often been particularly good-looking there was a feeling of resentment because "she had no time for me" or "was out all day working." The patients were, or at least felt, ill-treated, unwanted and left out. Allied feelings of inferiority were often concealed by a strong desire for independence, by over-weening ambition or by a compensatory, self-assertive, self-righteous attitude. Less submissive than the members of group 1, patients of group 2 showed traces of obstinacy, and without looking for trouble were always eager to champion the cause of the under-dog. At school some of them distinguished themselves as organisers and were house-captains and games-captains. Later in life their conscientiousness and ambitious drive qualified them as efficient workers; but when faced with frustration they tended, as in childhood, to be resigned grousers rather than open rebels. Their married life was usually unhappy and often ended in divorce or separation. Army life, with its demands for subordination, was particularly difficult for them, and they were well-known in their units as continual grousers.

Group 3.—This consisted of 3 men whose lifelong aggressiveness had arisen in childhood under circumstances similar to those which had produced the grousing resentment of group 2. They were full of resentment and on many occasions had displayed it only too openly. For this reason they had repeatedly been in trouble. Thus one man who walked out abruptly in the middle of the interview afterwards apologised and stated that similar incidents had often happened in civilian life.

Group 4.—The 12 members of this group (basically a subgroup of group 1) were infantile in build, asthenic or generally of poor physique. This was often combined with emotional and instinctual immaturity. In contrast to the first three groups they had always been delicate. They were ailing children subject, for example, to frequent colds. As one patient said: "Mother used to say, 'If the wind blows on you, you get a cold.'" Eight of them were unfit for games and said that even in childhood they became unusually short of breath when running. Because of their delicate health they had been spoiled by their parents, especially by their mothers, to whom they were greatly over-attached. A fair number of them described themselves as "mummy's boys" or "mother's pets" (one patient, until he was fifteen, used to sit on his mother's lap instead of playing with other children). There was a significantly frequent family history of heart disease or of symptoms similar to those of the patients. As is common with spoilt children, they were self-willed and stubborn at home but unduly meek and docile with other children elsewhere. Physically unfit to stand their ground, they were bullied and teased. Some were nicknamed "rake" or "lamp-post." If attacked, rather than stick up for themselves, they burst into tears and ran home in search of mother's protection or comfort. Their feeling of inadequacy made them quiet, shy and retiring. Painfully aware of his "sticking out ribs," one patient, even as an adult, would not strip in the presence of others unless under order. Though hampered by their physical inferiority, their high standards of achievement forced them to considerable efforts to do well in their occupations, but they often failed if the demands were greater than their resources; and when definitely faced by failure they were prone to react in unusual, primitive and childish ways. On joining up they suffered unduly from the separation from mothers and families and resented the hardships imposed by army life. They were often the butt of their comrades and in consequence were frequently isolated in their unit. They often broke down during training.

Group 5.—A well-defined group of 4 soldiers did not fit in with any of the other groups; they lacked the severe sense of duty universally found in the others, and in contrast to the "martyrs" of group 4, they were described in the army phrase as "quitters." Inferior in physique from birth and over-independent on their mothers, they had apparently given up the struggle for existence before it had properly started. From an early age, 2 of them complained of breathlessness and felt unfit for any competition, preferring a parasitic life to any attempt at work. One of them, the son of a father who had lived on a disability pension since the last war, said "Lots

of people live on the dole; why shouldn't I?" He declared that he was unfit when he was examined by the medical board, reported sick on arrival at his unit, and visited his M.O. with innumerable complaints.

PREDISPOSING AND PRECIPITATING FACTORS

Evidence of life-long physical inferiority was found in 15 of the 50 soldiers. Apart from the character deviations outlined, 18 gave a long history of nervousness or breakdown prior to the onset of effort syndrome. Phases of overt morbid anxiety, restlessness or severe phobias were the most common of these manifestations; previous nervous symptoms were almost absent in group 1.

Analysis of precipitating factors, which have been regarded as ætiological by some, shows that usually a number of concurrent factors preceded and possibly precipitated the disorder. In our series these were: emotional strain 34; physical strain 23; febrile illness 21; nicotine abuse 5; accident 4; gas poisoning 1.

Physical strain.—Detailed examination of what was described as physical strain revealed that the statement of over-exertion was justified in some cases by all standards and in others only because of the individual concerned, (for example, hard drilling in a man of inferior physique); in others, the preceding physical effort was so trifling that it could hardly be regarded as of any significance (playing cricket, lifting pots and pans in the kitchen).

Febrile illness.—In 14 cases effort syndrome developed immediately after what had apparently been an acute febrile illness, usually labelled influenza or acute bronchitis; 7 soldiers had previously suffered from some recurrent condition such as chronic bronchitis. In 1, effort syndrome, starting 20 years ago after influenza, had persisted ever since.

Toxic influences.—Cases with thyroid dysfunction were excluded from this series, and exotoxic factors, such as the abuse of alcohol and nicotine, did not occur to a significant extent.

Emotional strain.—Of the 50 patients, 34 either explicitly stated that they were, or, on examination, were found to be, suffering from acute or chronic emotional disturbances. Investigation of the nature of these showed, as was to be expected, variation with the personality type concerned. Conflicts over fear of showing fear (particularly after severe fighting experiences), problems relating to responsibility and an over-rigid morality, and breakdowns after obsessional over-work prevailed in group 1. Problems over subordination, obvious repetitions of former strained parent-child relationships, were predominant in group 2. Conflicts relating to compensatory over-aggressiveness were found in group 3. Obsessional self-drive in the face of physical inferiority was prominent in group 4, and escape into dependence in the face of apparently unsurmountable tasks was outstanding in group 5. Examples follow.

Cases in group 1.—A man of 31, unusually conscientious and scrupulous from early childhood onwards, a first-rate soldier, broke down after fighting experiences in France and developed an acute anxiety state in the course of which his present symptoms of effort syndrome started.

Another man, aged 40, similar in type, a reservist, noticed his first symptoms when, during the Munich crisis, the production in his factory was increased; eager to do everything "dead right" he felt that the increased speed of output interfered with the accuracy of his work; he became worse when, during the fighting in Belgium, a position of great responsibility was entrusted to him as a senior N.C.O.

A man aged 32, deeply religious, and over-rigid in his morality, overwhelmed by a sense of guilt, developed effort syndrome when his first sexual advances were rejected by his fiancée.

Cases in group 2.—A sergeant of 32 the son of a violent, drunken father and a "saintly" mother, had been from early childhood outwardly unaggressive although inwardly seething with rage and rebellion; although an apostle of puritanism, he was highly respected in his unit for his conscientiousness and reliability, and developed a severe anxiety state with concomitant effort syndrome when a sergeant-major, whose competence, rightly or wrongly, he seriously doubted, threatened him with degradation. "I always treated the Sergeant Major with due respect," he said.

Another man, aged 35, first suffered from effort syndrome on his return from leave spent in London with his mother; though manifestly overattached to her, he obviously possessed a deep unrecognised resentment of his illegitimacy; he professed a sense of guilt over being stationed in an area relatively safe from air-raids and, failing to recognise his obvious hostile, or double-edged, attitude to his mother, had actually applied for transfer to London in order to be near her.

Cases in group 4.—A man of short stature and very poor physique aged 44 had always been conscientious to an unusual degree and was an exceedingly hard worker; originally a corporal, he had been deprived of his stripes, when, owing to his lack of aggressiveness, he failed to intervene in a brawl; just before the war, unemployed and haunted by fear of insecurity, he became a coal-porter, a job for which he was definitely unfit; shortly afterwards he broke down with anxiety symptoms and effort syndrome.

A man of 23, delicate and ailing from early childhood onwards, his mother's "pet" owing to his continuous ill health, solitary as a child and reserved as an adult, always anxious to conceal his weakness and timidity, got on fairly well in his various civilian occupations until at 18 he started to work in a munitions factory; alternating night and day 12-hour shifts were too much for him but, although he felt the strain, he stuck it for 2½ years; in the Army, breathlessness and left inframammary pain bothered him during training, but he did not reveal his symptoms for several months and then only when specific inquiry was made by a medical board.

Case in group 5.—Another soldier, aged 23, quiet, shy and retiring was constantly ailing as a child, and was fussed over by both his parents and especially by the mother, to whom he was greatly over-attached (even now he is unduly dependent on her); at 14, on his first attempt at work, sorting out parcels he broke down and since then he has never made the slightest effort to try another job; he was completely unconcerned about his idleness and reported sick on arrival at his unit.

ÆTIOLOGY

These observations suggest the fundamental importance of emotional factors in the ætiology of effort syndrome. An ætiological study, however, would be incomplete unless the various other factors frequently encountered were taken into full account. Two selected cases, given with due consideration to all possible ætiological aspects, illustrate the complex nature of the ætiology in effort syndrome and may throw some light on the divergent views frequently advanced in regard to it.

An officer, aged 54, noticed his first symptoms of effort syndrome a month before examination. He was the son of a master-mariner who had chosen to go down with his ship, and of a mother of equally high standards. He was brought up in an atmosphere of strict discipline. He has always been a conscientious hard worker and a stickler for punctuality. He has never been able to relax, and his wife has often complained that, even when it was unnecessary, he would work over-time and at week-ends. Behind a façade of self-assurance he has always suffered from an unreasonable conviction of inferiority. He blushed easily and was apt to imagine that people were staring at him. He was a man of excellent physique and had never shown any gross nervous symptoms. Effort syndrome began with emotional disturbance. In the course of shelling, air-bombardment and machine-gunning he had several narrow escapes. During the evacuation from France he was nearly drowned. For a considerable time he struggled in the water until he was eventually pulled into another vessel, completely exhausted. On arrival in England he developed a febrile illness labelled acute bronchitis and was kept in bed for 10 days. Since then in addition to the symptoms of effort syndrome he has suffered from general nervousness, trembling, jumpiness, sleeplessness, battle dreams, and inability to think clearly.

A soldier, aged 20, first suffered from effort syndrome in January, 1940. He was thin, pale and almost childlike in appearance; owing to continuous ill health he had, from childhood onwards been wrapped up in cotton-wool by his mother and various governesses. Even now he finds it difficult to detach himself from a much adored governess with whom he keeps regularly in touch. A serious accident at 10 made him a temporary invalid and increased his feeling of helplessness. His inferior physique unfitted him for games and he was an easy prey to teasing and bullying. His aggressiveness handicapped at school, found an outlet at home

where he viciously tormented his elder sister. The pampering was continued in adolescence, when he found an easy job in his uncle's factory and, as the "boss's nephew," was treated with special consideration. He kept the job until he joined up. He is of infantile build. After his accident as a child he became temporarily unsociable, clung to his governess, suffered from jumpiness, nervousness, a feeling of inferiority and a fear of being stared at. Effort syndrome began with emotional disturbance. As would be expected, separation from home and the relative roughness of Army life constituted a special strain for a boy of his type. Almost from the first day he suffered badly from home-sickness, and the prospect of being sent over-seas drove him into a panic. Although he tried hard, he felt unable to stand the exertion imposed by his duties in the Army. Before his departure for France he had 10 days leave. During this time he had an attack of influenza which forced him to over-stay his leave; and shortly after his arrival in France he had "a second dose of flu," after which, owing to the onset of effort syndrome he had to be re-embarked.

DISCUSSION

None of the patients suffering from effort syndrome was found to be emotionally well-adjusted. The vast majority conformed to the obsessional type, possessing, as their most obvious characteristics, an over-keen sense of duty and over-rigid morality. Taking an every-day view of their personalities, they would be regarded as valuable members of any community, and the characteristics which they display would be classed as virtues. In these patients, however, these characteristics are found to be the result of early difficulties over instinctual drives which for some reason had aroused an undue sense of guilt; in other words, the actions are not virtuous by choice but by an internal compulsion against which they cannot, even if they would, rebel.

In some in contrast to those in the main group, aggressiveness was less repressed. In a very small number of patients over-dependence and self-pity were prominent, and they also displayed the "belle indifférence" of the hysteric. As might be expected, a clear-cut division between the obsessionals and hysterics was not possible, in some obsessionals superadded hysterical manifestations could be seen. There are obvious differences in the make-up of the obsessionals encountered in effort syndrome as compared with those in other psychosomatic disorders. In patients suffering from colitis, peptic ulcer and effort syndrome, the common factors are over-conscientiousness and over-scrupulousness. But, whereas the gastric ulcer patient is often concerned with economic security (problems of bread and butter) and the colitis patient with over-tidiness, over-cleanliness and hoarding carried to irrational extremes (Wittkower 1938) the effort-syndrome patient is preoccupied with problems of morality, self-regard, religiosity, patriotism, duty, responsibility and self-sacrifice. The over-cleanliness of the colitis patient compares with the sublimated puritanism of the effort-syndrome patient. The clinical pictures seen in the obsessional group ranged from gross anxiety states to obsessional character deviations with minor degrees of anxiety, often in a concealed form; 4 patients presented the picture of a florid anxiety state, 39 could be classified as character disorders of the obsessional type, and 4 were hysterics; 3 patients were psychotics, suffering from depressive states.

In all, 18 patients exhibited gross nervous symptoms prior to the onset of effort syndrome most commonly of a phobic nature. Later experience suggests that the breathlessness of effort syndrome is the physiological correlate of what appears in the psychological sphere as fear of suffocation (claustrophobia). On close inquiry most service patients disclose the existence of open or latent claustrophobia before the frank onset of effort syndrome; for example, they will have had uneasiness when travelling by underground, or they may complain of having felt faint or uncomfortable in warm rooms, or those without an open window. Difficulty or discomfort in wearing a respirator is also common and may often be demonstrated by a pulse- or respiration-rate which rises unduly when the patient is wearing the respirator. Evidence of life-long physical inferiority was found in 15 patients. A description of the physical findings in effort syndrome has been given by Spillane (1940).

The only constant factor in determining the occurrence of effort syndrome is the pre-existence of what is known as a character disorder—that is, a group of allied psychological characteristics, not regarded with anxiety by the patient, but nevertheless a definite indication of undue sensitivity to emotional stress of a specific nature. Since these character disorders regularly antedate effort syndrome, it appears legitimate to regard it as a psychological condition. Among the precipitating factors, emotional disturbances were commonest, and were found to be of a type to which the patient had been previously sensitised. Over-exertion, another fairly frequent factor preceding the onset of symptoms, is more often than not the result of an obsessional drive or of an intense desire to overcome physical inferiority—both of them manifestations of the basic character disorder. After febrile illness, even where, as is commonly the case, the effort syndrome did not antedate it, the symptoms of the syndrome persist for an unduly long time. We found no chronic infective process to explain this persistence nor has such a process been found by others. It is conceivable that the concomitants and after-effects of infection and over-exertion are utilised as a pattern to express an increase in an underlying state of tension. It is perhaps significant that respiratory infections seem to be particularly related to the onset of effort syndrome.

In the absence of deep analytical investigations an attempt to outline the psychopathology of the disorder is bound to be sketchy and speculative. The personality structure found in most of the patients, and the main presenting symptom—breathlessness—with its psychological correlate claustrophobia, point to the basic disorder as a warping in the early stages of instinctual development. The multiplicity of symptoms, however, makes it impossible, without the aid of analytical scrutiny, to be certain of a common denominator for all. With the onset of effort syndrome it is common to find, either as complementary or an alternative feature, depression (loss of interest, apathy) and disproportionate exhaustion, which is the physiological correlate of depression. Behind depressive and fatigue states (somatic depression) there has usually been some deep problem of aggressiveness. In the last war, as Hadfield (1933) pointed out, exhausted soldier patients who could hardly walk, would, under hypnosis, act out with great energy terrifying incidents, and afterwards be not more, but less, exhausted. This is a clear demonstration that depression and fatigue may be defences, or cover, for terrifying aggressiveness. (This phenomenon is also seen in cyclothymia, where the disappearance of depression releases maniacal excitement.) All the patients of this series showed signs of a long-standing conflict over aggressiveness; in the most common personality type, this was disclosed by such statements as: "I would walk a mile to avoid a row." The over-aggressive group does not contradict this statement, as it is usually found that the overt aggressiveness of such patients is merely a trickle acting as an unrecognised but important safety-valve for enormous reservoirs of pent-up aggressiveness. The same conflict over aggression was shown by acute anxiety over any exhibition of petty cruelty, or by terror of inflicting injury or hurt. This is well illustrated by the case of a sergeant who could not bear to see a picture of Christ with the thorns. "I just couldn't bear to see it," he said. "I could see the blood and it was very real to me, so it just had to be taken away"; or the case of another patient who experienced his first symptoms of effort syndrome while viewing a film of surgical operations. Similarly, some patients' fear of their own aggressiveness, even in speech, was shown in their unusually marked dislike of bad language.

Deep investigation would probably reveal that, as already suggested by this superficial study, problems of guilt over aggressiveness and destructiveness play a prominent part in the minds of these patients, and result in self-punishing and masochistic attitudes. Allied to this, and equally unrecognised by the patients, the onset of effort syndrome may, secondarily, be utilised by men of the obsessional type as an honourable retreat under a smoke-screen of physical symptoms from painful failure in military life. In the few hysterics this retreat is much nearer consciousness, and in the face of even minor hardships, in accordance with their life-long craving for sympathy, they utilise emotionally produced physical symptoms as an avenue of escape.

TREATMENT

Effort syndrome may occasionally occur in the form of episodes from which the patient makes a spontaneous recovery, but for the most part it is a chronic disorder. In the few cases in which it follows specific traumatic experiences, such as those of severe fighting, treatment by abreaction is indicated. These cases will usually fall into group 1 or 2. The others are less likely to have reached active service, as they break down in early training. The indiscriminate application of methods of treatment without due regard to the personalities concerned, possibly accounts for the inconstancy of reported results.

In peace-time, systematic psychotherapy seems to be indicated in group 1. Though certainly not an easy task, in view of the rigid superficial and deep morality of these soldiers, it would be worth trying, were it practicable in war, if only because most members of this group have usually been first-rate soldiers before their breakdown. The grouser type and the over-aggressive soldier (groups 2 and 3) are likely to respond to some extent to any form of psychotherapy which effectively releases their pent-up aggressiveness and diminishes the internal conflict over it. In group-4 cases experience shows that, while graduated exercises combined with superficial psychotherapy may be of some benefit, discharge is usually unavoidable. Group 5, the hysterical quitters, are definite martial misfits, and cannot be trained as soldiers. In some areas they are recommended for discharge as suffering from psychoneurosis (" hysterical group," " untreatably low personal morale "). To a modern army, with its necessarily high morale, such men are a greater menace than typhoid-carriers. Experience shows that it is a dangerous delusion to believe that punishment improves such types.

SUMMARY

Biographical studies were made on 50 effort-syndrome patients.

Five personality types were delineated:

The George Washington-Calvin-Quaker type (20 soldiers characterised by an unusually keen sense of duty and by a rigid superficial and deep morality, with severe repression of their aggressiveness); resigned grousers (11 soldiers, similar in structure, but less repressed in their aggressiveness); open rebels (3 soldiers, similar in structure, but overtly over-aggressive); men with inferior physique and obsessional drive (12 soldiers, similar in structure, endowed with inferior physique and struggling in vain against this handicap); hysterical quitters (4 soldiers).

Emotional strain was found to be by far the commonest precipitating factor.

Conflicts over fear of showing fear after severe fighting experiences, problems related to responsibility and over-rigid morality, and breakdowns after obsessional overwork, prevailed in group 1. Problems arising from strained parental relationships, sometimes resulting in problems over subordination, were predominant in group 2. Conflicts related to over-aggressiveness were found in group 3. Obsessional drive versus physical inferiority was prominent in group 4, and escape into dependence in the face of apparently insurmountable tasks in group 5.

The interplay of the various concomitant ætiological factors (febrile disease, physical strain, toxic influences) is illustrated by some typical examples.

It is concluded that effort syndrome is predominantly a disorder occurring in individuals of an unduly high and severe self-regard, and the importance of repressed aggression in most of the patients is emphasised.

Treatment by abreaction is indicated in the few cases in which the syndrome follows specific traumatic experiences. Systematic psychotherapy is indicated in group 1; groups 2 and 3 respond to psychotherapy releasing aggressiveness and reducing conflict over it; group 4 may respond to graduated exercises and superficial psychotherapy; group 5 cannot be trained as soldiers.

We wish to thank Sir Thomas Lewis for his interest, the superintendent and staff of the emergency hospitals concerned for their collaboration, and Lieutenant-Colonel F. A. E. Crew, R.A.M.C., for his help. We are grateful to the Halley-Stewart Trust and the Rockefeller Foundation for their grants which made this study possible.

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REJECTION OF PSYCHIATRICALLY UNFIT RECRUITS

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OFFICIAL arrangements are being made to ascertain which potential recruits have been patients in mental hospitals or in institutions for mental defectives. Much more numerous are men with lesser psychiatric disorders who have never been in such institutions but who may have been treated by their own doctors or by psychiatrists in outpatient clinics and special psychiatric hospitals. The object of this short paper is to record some unofficial work that has been done in helping to reject such cases from recruiting. No doubt civilian psychiatrists all over the country are doing the same thing, but it is time that more official provision was made, for many patients must escape this unofficial survey. I have heard in one way or another of 13 former patients of the Jordanburn Nerve Hospital who, presumably, did not reveal their psychiatric condition and were passed fit. Of these, 2 have not yet been called up and 6 have broken down or are showing gross symptoms.

Lord Horder's committee, appointed by the Minister of Labour, recommended among other suggestions for excluding tuberculous recruits, that medical officers of health might provide every man who appears on their tuberculosis registers with a notification for the medical board and might send a similar notification direct to the Minister of Labour.[1] If psychiatric departments were required to do the same for their cases, many unsatisfactory recruits would be rejected.

Since the beginning of the war I have been consulted about the fitness for military service of 38 male patients of the Jordanburn Nerve Hospital. Most of them came on their own initiative before their medical examination; in some cases inquiries were sent by the recruiting medical boards. A summary of each patient's illness was submitted to the boards and it was suggested that 31 were unfit for any form of military service and that 7 were fit for full or modified service. Many of the patients were returning for treatment and in only 2 cases, to my knowledge, were the suggestions altered by the boards—in each case modified service was raised to full service. The 31 totally unfit were of the following groups:

Paranoid reaction	1	Feeble-mindedness	1
Manic-depressive reaction	1	Epilepsy	1
Schizophrenic reactions	9	Anxiety states	9
Schizoid states	4	Hysterias	2
Psychopathic states	2	Neurasthenia	1

The group of schizophrenias were all relatively mild reactions but included 2 of the 3 cases in the whole series who had ever been in a mental hospital. Lest it be thought that a psychiatrist's report is an easy way out of military service for the shirker, the cases were classified according to the time at which they first consulted their own doctor or the psychiatrist. The period between Aug. 31, 1938, and Aug. 31, 1939, was taken, covering as it did the few days before the Munich crisis and lasting almost to the outbreak of war.

First attended before Aug. 31, 1938	15
First attended before Aug. 31, 1939	10
First attended after Sept. 1, 1939	6

1. *Lancet*, 1940, **2**, 28.

Thus only 6 patients—out of a series of 31 attending up to the beginning of April, 1941—first attended after the outbreak of war. Of these, 3 were cases of schizophrenia and 3 were frankly unable to face up to war conditions; 2 of the latter 3 have been reported elsewhere.[2] The 7 cases recommended for service were classified as: schizoid personality, 1; psychopathic states, 2; anxiety states, 2; obsessive states, 2.

Full service was recommended for 3 and modified service for 4, of whom 2 were raised by the boards to full service. Of the 7 men, 4 have not yet been called up, 1 of these raised from modified to full service developed fresh symptoms in the Army and was discharged; 1 is serving and 1 has not been traced.

Henderson [3] has suggested that the examination of the mental qualities of recruits could be accomplished with a minimum of difficulty if all recruits at the time of enlistment were asked to present a statement of their previous medical history from their own doctor. He also suggested that psychiatrists should be appointed to recruiting boards. This would certainly be an economic measure since it appears that a fair proportion of breakdowns on service occur in men who have not had actual breakdowns before, but who have recognisably abnormal personalities (see Curran and Mallinson, Logan[4]).

I thank Prof. D. K. Henderson for his advice in the preparation of this paper.

SEPARATION OF SERUM IN BULK

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THE following technique has been developed for the rapid separation of serum from a large volume of clotted blood collected in standard transfusion bottles.

The blood is taken in the usual way, and the bottles are placed at a slight slope, almost horizontally, and left in a refrigerator at 2° to 6° C. overnight. If they are not sloped the clot may adhere to the whole surface of the bottle and fail to contract, so that the yield of serum is poor. The clot formed in a sloped bottle, however, slides to the bottom when the bottle is placed upright, and since it then contracts freely the yield of serum is maximal. Next day the bottles are righted and allowed to remain for a further 24 hours in the refrigerator or they may be moved to the cold store of the processing station. There, some 48 hours after bleeding, they are transferred to a room used only for the separation and filtration of serum. The floor and benches are treated twice a week with spindle oil (crude liquid paraffin)[5] windows are kept closed to reduce movement of dust particles to a minimum, and sterilised gowns, caps and masks are worn by all who work there. As suggested by Pulvertaft (private communication) the air is sprayed (30 strokes of a Flit spray per 1000 c. ft.) with a freshly prepared solution of 0·6 c.cm. eugenol carbinol, 7·5 c.cm. glycerol and water to 100 c.cm. This operation is repeated every 15 minutes when the room is in use. In this way the air-borne bacterial flora can be reduced to such proportions that a blood-agar plate exposed for half an hour under working conditions develops only 5–7 colonies after incubation for 48 hours at 37° C.

Each bottle of clotted blood is placed in turn in the right-hand compartment of a glass-fronted, wooden cabinet (fig. 1) and is thus shielded from the operator during manipulation. All parts of the cabinet are treated with liquid paraffin, so that any dust falling on the surfaces (internal or external) is retained. The cap of the transfusion bottle is removed and placed, open

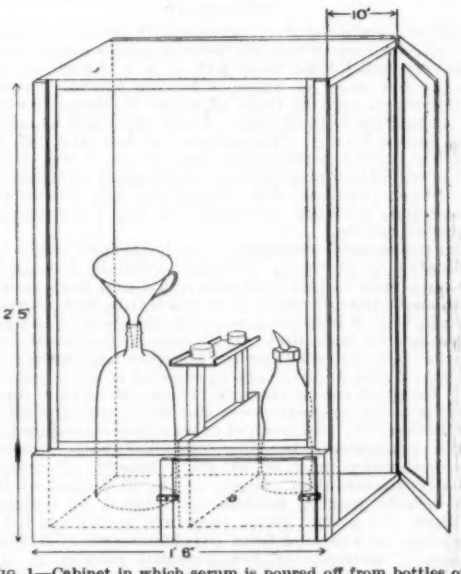

FIG. 1—Cabinet in which serum is poured off from bottles of clotted blood.

end downwards, on a sterile slip of calico on the shelf, and the screw-cap with spout (fig. 2) is screwed into position on the bottle. The serum is then poured off the clot through an enamel-iron or glass funnel, lined with metal gauze or muslin, into an 80 oz. Winchester. The metal tongue on the inside of the screw-cap prevents the clot slipping forwards and blocking the neck of the bottle. As the serum is poured off, the bottle is rotated through 180° about its long axis and tilted until it hangs vertically downwards; thus all serum drains from behind the clot. This operation completed, the spout is unscrewed; a second bottle of clotted blood is transferred to the cabinet, its screw-cap is placed on the sterile slip of calico, and the spout is screwed into the new bottle. The bottle from which the serum has been drained is re-capped. Pouring in this way, it is possible for one person to separate the serum from 40 pint-bottles of clotted blood in an hour. All equipment (except the cabinet) is autoclaved before use. The transfusion bottles from which the serum has been poured are returned to the refrigerator for 48 hours. During this interval the

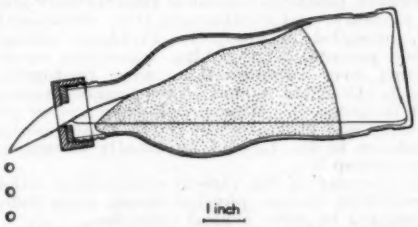

FIG. 2—Section of screw-cap with spout and tongue fitted to bottle of clotted blood so that serum can be poured off without clot (stippled) blocking neck. The horizontal line indicates the level of fluid (serum and red cells).

clot continues to contract, and on pouring for a second time as much as 10–12% of the original yield may be obtained. The screw-capped Winchesters of pooled serum are stored in the refrigerator for at least 48 hours, in order that the bulk of the suspended red cells (about a thirtieth of the volume of liquid separated) may have time to settle. There is always a small fraction of the red cells —damaged and immature cells (Stephens[6])—which settles more slowly. After 48 hours in the refrigerator only the upper third of serum is free from cells; the lower two-thirds still contain a few cells in suspension. At the end

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3. Henderson, D. K. Physician Superintendent's report for 1939, Royal Edinburgh Hospital.
4. Curran, D. and Mallinson, W. P. *Lancet*, 1940, **2**, 738; Logan W. R. *J. ment. Sci.* 1941, **87**, 241.
5. van den Ende, M., Lush, D. and Edward, D. G. ff. *Lancet*, 1940, **2**, 133.
6. Stephens, J. G. *J. Physiol.* 1940, **99**, 30.

of 48 hours or so the serum is rapidly separated from the deposit of red cells and transferred to sterile 80 oz. Winchesters by means of the suction unit (fig. 3). Any red cells remaining in suspension are removed in the subsequent filtration through Ford F.C.B. and S.B. pads in a Seitz filter. The yield of serum obtained by this method varies between 46 and 48% of the blood collected.

DETAILS OF CONSTRUCTION

The cabinet (fig. 1) is made of wood with a pane of glass in front. There is a door on the right and another may be fitted on the left if desired. The lower part of the front is of wood and is provided with a hatchway into the right-hand compartment through which the operator's left hand may be inserted to hold the bottom of each bottle while unscrewing or screwing on the cap. When the cabinet is not in use the hatchway is closed by a cover, fixed by turn-buttons or hinged.

The screw-cap with a spout and a flat tongue (fig. 2) is made of brass and copper, chromium-plated. It is important that the spout be turned down as shown, since a separate air-inlet is then unnecessary. The cap is threaded so as to screw on to the transfusion-bottle, and a standard

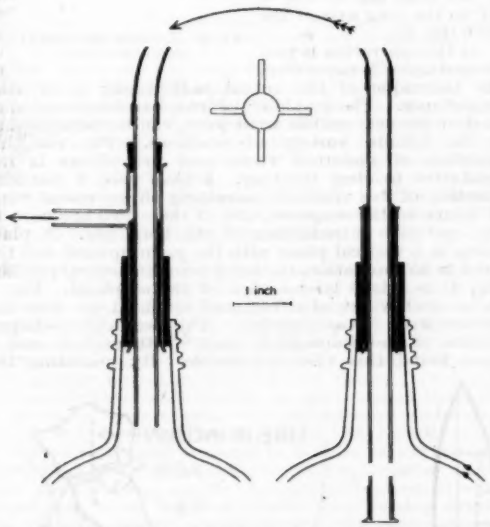

FIG. 3—Suction unit for rapid separation of serum from deposit of red cells. The metal baffle which loosely covers the lower end of the suction-tube is shown above as it appears before being bent into shape.

rubber liner, through which a central hole has been bored, serves as a washer. The spout is about 1½ in. long; the tongue about 6½ in. The latter is curved, in order to reduce to a minimum the risk of piercing the clot while screwing on the cap.

The suction-tube and delivery-tube of the suction unit (fig. 3) are made as wide as possible in order to accelerate the separation of the serum from the deposit of corpuscles. The air-inlet and air-outlet are wide-bored glass tubes, concentric about the suction-tube and delivery-tube, and made to fit the necks of 80 oz. Winchesters by covering with a sleeve of thin-walled rubber tubing of wide bore or binding with adhesive plaster. In this way the size limit imposed by a two-holed bung is avoided. The spaces between suction-tube and surrounding air-inlet, and delivery-tube and surrounding air-outlet, are packed with cotton-wool and act as air filters. The lower end of the suction-tube is loosely covered with a metal baffle which prevents disturbance of the layer of corpuscles. With this in position the end of the tube can be lowered by sliding through the inlet filter to within a few millimetres of the corpuscle deposit without disturbing it. Two litres of serum can be separated from the corpuscle layer without frothing in under a minute, provided the unit fits securely in the necks of the two Winchesters and the cotton-wool filters are not too tightly packed.

CLOSED TECHNIQUE FOR FIXATION OF FRACTURED CARPAL SCAPHOID

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THE establishment of fracture clinics for Service patients has provided a unique opportunity for study of fractures of the carpal scaphoid. Thorndike and Garry (1940), Hopkins (1933) and others have pointed out that this injury occurs chiefly in men between the ages of 18 and 30 who are engaged in strenuous work. In a Service clinic, drawing its cases chiefly from this age-group, the incidence of these fractures is high.

Difficulties in treatment are largely confined to fractures through the waist and proximal third of the bone, and considered from the point of view of non-operative treatment, cases fall into two broad groups. Fractures seen within a few days of injury unite in a high percentage of cases if effective immobilisation is immediately established and maintained until radiological examination shows firm bony union; this can be expected in from 8 to 12 weeks. In a high proportion of cases, however, a period of weeks, months or even years has elapsed before the patient presents himself for treatment. In these, provided non-union—as shown by sclerosis at the fractured surfaces—has not been established, bony union may result from immobilisation alone, if it is maintained for periods ranging from 4 to 18 months (Böhler 1935, Watson-Jones 1940a). In civilian life such treatment may be compatible with a comparatively normal existence on the part of the patient, but in the Services under war-time conditions immobilisation of one wrist in plaster renders a man non-effective. In the case of highly trained personnel this is important, and any form of treatment which could be relied on to cut down the period of immobilisation necessary to obtain bony union would be of great value.

Three main factors probably influence the delay in union so often observed in fractures of the scaphoid. The first is the structure of the bone, which is cancellous and without a true periosteum, so that new bone formation is slow (Johnson 1927). Secondly, the fracture must interfere to some extent with the blood-supply to the fragments. The exact extent to which this occurs is controversial; Johnson believes that it is not important. It seems probable, however, that the view of Watson-Jones (1940b) is more accurate, and that the degree of disturbance depends on individual variations in the blood-supply and on the site of the fracture. Minor degrees of disturbance, insufficient to produce avascular necrosis of one fragment, would account for the wide variations in the rate of union observed in fresh cases treated by immediate immobilisation. The third factor is the degree of movement which is allowed to take place between the fractured surfaces. The scaphoid, articulating with five other bones, with its proximal joint surface forming part of the wrist-joint and its distal surface part of the mid-carpal articulation, is extremely difficult to immobilise. When it is fractured through the waist the fracture line lies in the plane of the midtarsal joint, and as the radial fragment tends to move with the distal row of the carpal bones any movement at this joint produces a shearing strain across the line of fracture, tearing the delicate capillaries which are the framework of the process of repair. The degree of movement which takes place between the fragments is shown in fig. 1, a and b. It can easily be demonstrated by radiography that after a few days any form of plaster cast compatible with free finger movement allows a considerable degree of movement of the scaphoid if the patient attempts forcible adduction and abduction at the wrist.

These factors seem to indicate that the ideal method of treatment in the second group of cases would be some form of internal fixation, preferably by the use of an autogenous bone peg. This, together with a plaster cast immobilising the wrist, should result in absolute fixation

of the fragments with the fractured surfaces in close apposition, and, since the introduction of the bone peg breaks up any fibrous tissue between the bony fragments, should hasten bony union.

The results of such operations recorded in the literature are disappointing. First performed by Adams and Leonard (1929), who introduced a slot graft from the radius into the dorsal surface of the scaphoid, the technique was later improved by Murray (1934), who fixed the fragments with an autogenous bone peg. Using a curved incision over the lateral aspect of the wrist he exposed the tubercle of the scaphoid by retraction at the anterior convexity of the incision, and by retraction of the posterior skin flap and division of the dorsal ligament of the wrist also exposed the line of fracture. The tubercle was nipped off to allow countersinking of the peg, a drill was introduced through the tubercle and made to cross the line of fracture, its position being controlled by direct observation at the fractured surfaces, and a graft cut from the tibia was introduced through the drill hole and driven home. In a later paper Murray (1936) reported 16 cases in which this operation had produced bony union, the average time between operation and return to work being four and a half months. While these results are excellent in that bony union was achieved in all cases the period of treatment necessary is not convincingly decreased when compared to results obtained in similar cases by immobilisation alone. Cave (1940) reported 13 cases in which operation had been performed. In these cases the scaphoid was exposed by a dorsal incision, the fracture identified, and drill holes made direct through the fractured surfaces, the ulnar fragment being steadied by a spoon introduced between this fragment and the semilunar. A tibial peg was then introduced into the drill holes and the fragments forced together. In only 3 of these cases did bony union follow operation.

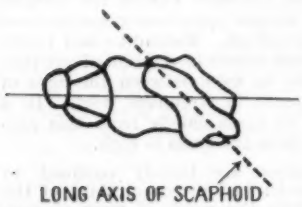


FIG. 2—Relation of scaphoid to transverse plane of wrist.

side this is due to the turning forward of the outer parts of the scaphoid and trapezium, which carry the thumb in front of the rest of the metacarpus. The proximal surface of the carpus, articulating with the inferior surface of the radius and the triangular fibrocartilage, is convex, owing, on the radial side, to a turning downward of the radial half of the scaphoid. The midcarpal joint is also convex upward, so that the ulnar half of the scaphoid lies proximal to this joint while the radial half lies on its outer side. These facts explain the position of the scaphoid as a whole relative to the longitudinal and transverse planes of the wrist. With the hand in the anatomically neutral position the long axis of the scaphoid lies at an angle of 45° to the transverse plane of the wrist (fig. 2) and at 40° to the long axis of the limb (fig. 3).

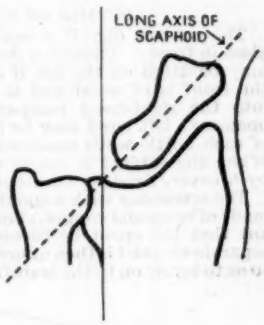


FIG. 3—Relation of scaphoid to long axis of wrist.

As this operation is performed under X-ray control the technique of the actual radiography is of vital importance. The scaphoid, of irregular shape and situated at the very mobile wrist-joint, can be radiographed in an infinite variety of positions. The resulting selection of distorted views and art effects is not conducive to clear thinking. I have used a standard selection of five views on examining all my recent cases of injury to the scaphoid, and of these two are used in the operative introduction of the bone peg. A plate taken in a vertical plane with the palm upward and the wrist in 45° pronation, the hand being in neutral position (fig. 4) is a true lateral view of the scaphoid. Fig. 5 shows such views of a fractured scaphoid (B) with the normal wrist (A) as a control. The clear kidney-shaped outline of the scaphoid is easily distinguished, and I have found this view invaluable. By pronating the wrist a further 90° a true postero-anterior picture is obtained. This position is much more easily held by the patient than the position (45° supination, palm upward) necessary to obtain a true antero-posterior picture of the scaphoid, and corresponds with the "oblique" view in common use. These two views, lateral and postero-anterior, in planes at right angles to each other, are used to control the introduction of the peg.

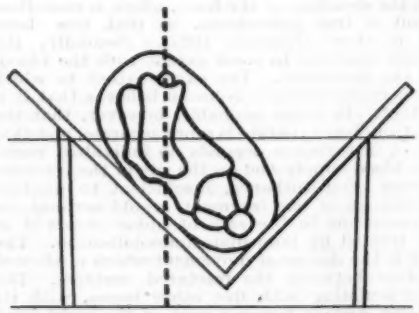


FIG. 4—Wrist on rest. Dotted line indicates plane of lateral radiogram and of insertion of guide.

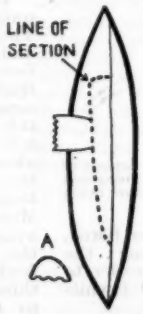


FIG. 6—Cutting bone-peg from anterior sharp margin of tibia. A, cross-section of peg.

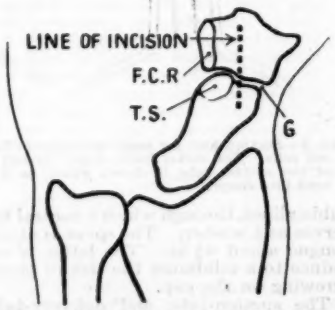


FIG. 7—Line of incision and adjacent landmarks, T.S., tubercle of scaphoid; F.C.R., groove on trapezium for flexor carpi radialis; G, groove between trapezium and scaphoid.

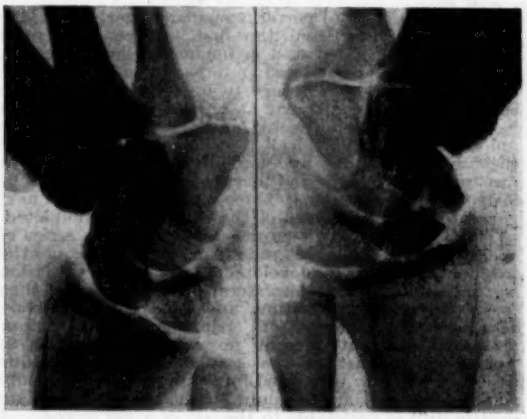
CLOSED METHOD

These techniques are open to grave objections in that they entail considerable stripping of the scaphoid with consequent disturbance of its blood-supply. This decrease in a blood-supply already damaged might reasonably be expected to offset the advantages of complete immobilisation with the fractured surfaces in close apposition achieved by fixation with a bone peg. To overcome these disadvantages I have developed a "closed" operative technique—a method whereby the peg can be introduced through a small skin incision under radiographic control, without any exposure or stripping of the fragments of the scaphoid. The key to any such operative procedure is a clear mental picture of the shape and position of the scaphoid. The carpus as a whole has a decided anterior concavity. On the radial

It is convenient next to consider the position of the limb during the introduction of the guide and peg. If the wrist is held palm upward, in 45° pronation, the hand being in neutral position, the long axis of the scaphoid lies in a vertical plane (fig. 4) at an angle of 50° to the perpendicular. This is a convenient position as it is comparatively easy to introduce a guide in a

A B

FIG. 1—Degree of movement which takes place between fragments of scaphoid with wrist in (A) adduction and (B) abduction.

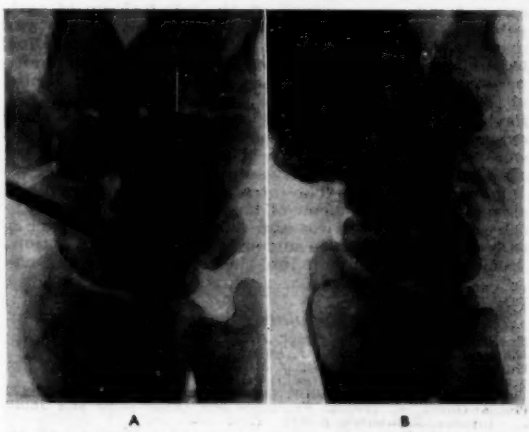


A B

FIG. 5—Lateral views of scaphoid; (A) normal, (B) fractured.

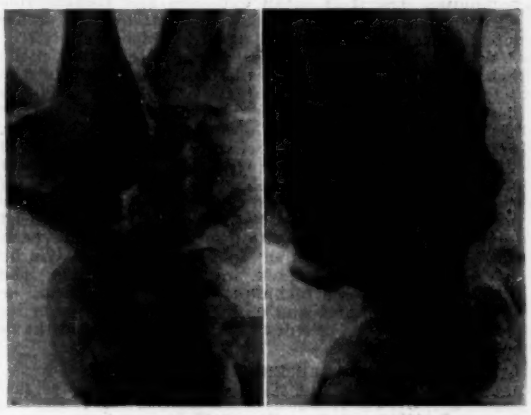
vertical plane and the surgeon need only concentrate on judging the necessary angle to the perpendicular. So that the wrist may be held firmly in this position I have devised a simple rest, consisting of two pieces of wood fixed at right-angles to each other and held in a stand so that each lies at an angle of 45° to the horizontal. The rest is about 10 in. long and padded with felt, about a third of it being padded with a very thin layer, to accommodate the hypothenar eminence and allow the hand to remain in neutral position.

With the patient under general anæsthesia a short incision is made over the anterior sharp margin of the tibia, and this is cleared by a few strokes with a periosteal elevator. A small piece of bone is cut from this margin as shown in fig. 6 and is placed in a bowl of saline. The graft, roughly triangular on section, can be rounded to a suitable shape with a sharp scalpel, or with nibbling forceps, but this is conveniently done while waiting for films showing the guide in position to be developed. The rest described is placed on a table of suitable height and covered with a sterile towel, and the affected wrist is placed in position on the rest and firmly held by an assistant. After careful palpation an incision about ¾ in. long is made, beginning over and rather to the lateral side of the scaphoid tubercle and running distally (fig. 7). This incision exposes fibres of the thenar muscles which are gently separated by blunt dissection until the tubercle of the scaphoid lies in the depth of the wound. The three essential landmarks at this stage are the tubercle of the scaphoid, the groove on the trapezium for the flexor carpi radialis and the groove between the trapezium and the scaphoid. These are identified by palpation with a probe and a spot is selected on the outer side of the scaphoid tubercle and just proximal to the groove between the trapezium and the scaphoid. At this point a guide or drill is inserted into the scaphoid, and driven inward in the vertical plane at an angle of 50° to the perpendicular. I have used a shortened Steinmann's pin and also an electric drill for this purpose. Each has its advantages; the drill is more easily kept in the desired plane while with the pin introduced by hand the fracture is more easily felt. When the scaphoid has been penetrated to about an inch—any approach to its articular surface is easily detected by an increased resistance—the drill or holder is detached. Views are then taken in the planes already described, and while these are being developed the peg is shaped to a size only slightly larger than the guide used. The peg is shaped so that there is a slight increase in its thickness about an inch from its point; this helps to grip the radial fragment when the peg is driven home and causes impaction at the fractured surfaces. As soon as the plates are developed these are inspected, and should the position of the guide be unsatisfactory a second attempt is made, the direction being modified in the light of the malposition shown. When a satisfactory position is obtained and confirmed by X ray (fig. 8, A and B) the track is slightly enlarged by careful manipulation so that the drill or pin slides easily in and out. The peg is then driven home, and should fit snugly into the track. The position is then checked again by X ray, and if the peg is well home, impacting the fracture (fig. 9, A and B) it is cut off short at the tubercle of the scaphoid. The wound is closed with a few sutures, covered with gauze and a padded plaster cast is applied.



A B

FIG. 8—Guide in position; (A) postero-anterior, (B) lateral view.



A B

FIG. 9—Bone-peg in position; (A) postero-anterior, (B) lateral view.

The patient suffers little inconvenience after operation, and is encouraged to perform regular finger, elbow and shoulder exercises from the first. Seven days after operation the padded cast is removed, the sutures are taken out of the wound and an unpadded cast is applied. The patient can then return to light duty and attends the outpatient department at regular intervals so that his plaster can be inspected and the progress of bony union checked radiologically. When union is complete the cast is discarded and two weeks later the patient can return to his usual occupation. He should be instructed to report every three months during the next year so that a full record of the case can be completed.

This technique has been developed during a series of operations for delayed union or non-union of the scaphoid. During its development my primary incision has shifted from a posterolateral to a lateral, and then to an anterolateral position, and I have progressively decreased the amount of stripping and retraction necessary until at present no attempt is made to "clear" any part of the scaphoid. The technique described has now been used for some time and the only point on which I am in doubt is whether the use of an electric drill is preferable to the use of a pin introduced by hand. If an efficient Albee drill without any "whip" is available I think it will facilitate the operation; in other circumstances I should use a pin.

The results of cases so treated have been most encouraging and although their number is not sufficient fully to support a claim that this method substantially reduces the period of treatment necessary to obtain firm bony union I believe this to be true. The operation is not particularly easy to perform and success depends on attention to every detail. It would of course be possible to do considerable damage to the wrist or midcarpal joint by a carelessly introduced guide, but such a catastrophe would be the fault of the surgeon and not of the operation. Mr. Eric Lloyd's aphorism on nailing the neck of the femur seems equally applicable to bone-pegging a fractured scaphoid; "the bad results of pegging are the results of bad pegging."

SUMMARY

The incidence of fracture of the carpal scaphoid is such that large numbers of these cases are seen in Service fracture clinics.

Treatment by immobilisation alone does not always produce good results in cases of "old" fractures or in cases of delayed union. Disturbances of blood-supply, even if not sufficient to cause avascular necrosis of one fragment, probably account for the delay in union so often seen in these fractures.

It is difficult to produce absolute immobilisation of the scaphoid for more than a few days with any form of splint or cast compatible with free finger movement.

In theory the ideal treatment of cases of "old" fracture or of delayed union is by internal fixation using an autogenous bone peg; but the published results of cases so treated are disappointing. The operative techniques described entail exposure and considerable stripping of the scaphoid, with consequent further interference with an already damaged blood-supply.

With the hand palm upward in neutral position, if the wrist be held in 45° pronation, the long axis of the scaphoid lies in the vertical plane at an angle of 50° to the perpendicular. A radiogram taken with the wrist in this position gives a true lateral view of the scaphoid.

Using a rest to hold the wrist in this position a drill introduced through a small incision on the lateral aspect of the tubercle of the scaphoid and driven inward in the vertical plane at an angle of 50° to the perpendicular passes through the centre of both fragments of a fractured scaphoid. When the position of the drill has been checked radiologically a bone peg from the tibia can be driven along the drill track, impacting and fixing the fracture. This closed technique avoids any exposure or stripping of the bone, and entails no disturbance of its blood-supply. The results of cases so treated have been satisfactory.

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IMMUNITY REACTIONS AFTER ULTRAVIOLET IRRADIATION OF THE SKIN

By ALBERT EIDINOW, M.B. Lond.

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ULTRAVIOLET rays are employed to increase resistance to infections by improving local and general immunity. So far it has not been possible to obtain graphic or numerical results to establish these effects. Investigations were therefore planned to study the local reactions and specific immunity response when a standard quantity of antigen (hay-pollen toxin or T.A.B. vaccine) was injected intradermally into areas of normal skin and skin irradiated with ultraviolet light.

HAY-POLLEN TOXIN

Patients who were sensitive to hay-pollen toxin and suffered from hay-fever were chosen for these experiments. Erythema reaction was produced by exposure of a circular area of the skin of the arm or forearm 1 in. in diameter. The high-pressure vacuum type of quartz water-cooled mercury-vapour lamp was used, with an electrical energy of 2·5 amp. and 140 volts D.C. between the electrodes. The quartz face of the lamp was directly applied to a selected circular area of skin for 1¼ min. The area of skin was marked with a dermatograph pencil. A patch of erythema developed; the maximal reaction was reached 48 hours after irradiation, and this time was chosen for scarification or intradermal injection of hay-pollen toxin. Later, the redness and œdema of the skin faded, desquamation followed, and after 12–14 days only a faint pigmentation was visible; this persisted for many weeks.

Scarification test.—The skin was scratched with a sterile surgical needle. The hay-pollen toxin used (P.D. & Co.) contained 10,000 units of toxin per c.cm. Dilutions of toxin were made with sterile saline, so that samples containing 100, 500, 1000 and 10,000 units per c.cm. were available. Six patients who suffered from hay-fever were selected. In each subject four areas of skin on the right forearm were exposed to ultraviolet rays by the method described; 2 days later areas of erythema were visible. Scarification tests were made 48 hours after the exposure to ultraviolet rays; there was little reaction; erythema and surrounding œdema were increased when the strongest dilution of toxin was applied, but there was no evidence of weal formation and no symptoms of increased irritation or itching. Scarification tests with similar dilutions of hay-pollen toxin were made 4, 7, 9 and 11 days after irradiation but no allergic reaction was visible in areas of irradiated skin. Some 3 weeks after irradiation, scarification tests showed a weak reaction with the stronger dilution of pollen toxin. At this stage pigmentation was established.

By way of control four similar areas of skin were mapped out with a pencil on the left forearm of each patient. In the centre of each area scarification was made with dilutions of hay-pollen toxin corresponding to 10,000 units, 1000 units, 500 units and 100 units per c.cm. A zone of erythema appeared within 15 min. at the sites of scarification of the normal skin of the left forearm. This increased in intensity until a weal and œdema of the urticarial type appeared. These lesions were very irritable, but reaction reached its maximum after an hour and gradually subsided 2–3 hours later.

Intradermal tests.—The intradermal injection into the normal skin of 0·1 c.cm. of hay-pollen toxin (50 units) causes redness, urticaria and œdema, spreading over a wide area of the forearm surrounding the site of injection. A similar injection made into the centre of an erythema-

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tous area of skin 48 hours after exposure to ultraviolet rays caused sudden redness, œdema and swelling over a wide area of the forearm; itching was intense. Within 15–30 min. patients felt ill and showed symptoms of hay-fever and often of asthma. Lacrimation, rhinorrhœa and salivation were followed by visible swelling and œdema of the eyelids and orbits, lips and face, and flushing and sweating of the skin. Vomiting occurred at times, breathing was oppressed and asthmatic. The pulse became rapid and feeble and was almost imperceptible at the wrists; systolic blood-pressure was low and patients were collapsed. Injections of adrenaline relieved the symptoms; at times camphor, Coramine or digitalin were necessary. These attacks continued for 1–1½ hours. Some days after the attacks patients stated that they had had no further hay-fever. Intradermal and scarification tests of the normal skin gave less reaction, suggesting a greater immunity to the action of the toxin.

T.A.B. VACCINE

For these experiments 14 patients were divided into two groups. Blood samples were collected by venepuncture and serum was separated after the blood had clotted. One group of 7 patients were given intradermal injections of T.A.B. vaccine into areas of normal skin of the forearm or arm; the other 7 were given similar injections into areas of erythematous irradiated skin. The agglutinin content of the blood-serum was estimated by the standard technique described by the Medical Research Council. The first series of experiments were carried out with the standard H (rough) culture of T.A.B.

Control group.—Blood samples were taken from the 7 patients in this group and samples of serum were collected. The T.A.B. vaccine (P.D. & Co.) contained 100 million *Bacterium typhosum*, 50 million *Bact. paratyphosum* A and 50 million *Bact. paratyphosum* B per c.cm. A 1 c.cm. vaccine syringe with an intradermal needle was used, and intradermal injections of 0·1 c.cm. of the vaccine were made into the skin of the forearm and arm. A week later a blood sample was taken, serum was collected and a further intradermal injection of 0·1 c.cm. of vaccine was made. Blood samples were collected 16 days later. The injections caused little local or general reaction.

Irradiated group.—In each of these 7 patients a circular area on the skin of the arm or forearm was irradiated in the manner described. After 2 days a circular patch of erythema was well developed; a blood sample was collected by venepuncture and an intradermal injection of 0·1 c.cm. T.A.B. vaccine was made into the centre of the circular patch of erythematous and irradiated skin. After 5 days the skin of the opposite arm was exposed to the mercury-vapour lamp in the same manner, so that a full erythema reaction was produced; 2 days later (7 days after the first injection of T.A.B.) a blood sample was collected and a further injection of vaccine T.A.B. 0·1 c.cm. was given intradermally into the centre of the circular patch of erythematous and irradiated skin. Blood samples were collected 16 days later. Some blanching of the skin and bleeding was visible directly after intradermal injection, but disappeared later. There was little reaction after the injections; desquamation and pigment formation took their normal course.

The sera of the two groups of patients were always tested simultaneously so that equal numbers of control and irradiated patients were tested with the same and identical dilutions of standard agglutination cultures. The sera collected before injection of T.A.B. vaccine and a week after the first inoculation were tested in one batch and the sera collected 16 days after the second inoculation were tested together as a second batch. The sera were stored in an ice-chest at 2° C. Equal volumes of known dilutions of agglutination cultures, made with sterile saline, were mixed with equal volumes of the samples of serum and put into Dryer's tubes in a water bath at 55° C. for 2 hours. Readings were recorded after 2 hours and again after leaving the samples standing on the bench for 24 hours; three samples of serum were collected from each patient. The samples were tested against standard agglutination cultures of typhoid, paratyphoid A and paratyphoid B (H cultures).

The results are shown in the table. Each group of 7 patients gave similar results except for one patient in group 1 who had been inoculated with T.A.B. prophylactically 14 years before. This patient gave an agglutination against a dilution of 1/400 for *Bact. typhosum*, and 1/40 for *Bact. paratyphosum* A and B; intradermal injection into the normal skin increased these agglutinations to 1/4000 and 1/200.

These observations show that intradermal injection of T.A.B. vaccine into areas of irradiated and erythematous skin produces a higher titre and a greater concentration of agglutinins in the sera than is obtained from intradermal injection of the vaccine into normal skin. The agglutination titre after intradermal injection into areas of irradiated and erythematous skin was 1/10,000 for *Bact. typhosum*, 1/1000 for *Bact. paratyphosum* A and 1/200 for *Bact. paralyphosum* B. The agglutination titre after intradermal injection into areas of normal skin was 1/600 for *Bact. typhosum*, 1/60 for *Bact. paratyphosum* A and 1/40 for *Bact. paratyphosum* B (H). The dose of T.A.B. vaccine given intradermally was 0·1 c.cm., which is 1/5–1/10 the dose usually given subcutaneously for prophylaxis. The agglutination titre of the sera after intradermal injections of 0·1 c.cm. of T.A.B. vaccine into the irradiated and erythematous skin is as high as that which is usually obtained after subcutaneous injections of 0·5 c.cm. or 1 c.cm. After the intradermal injections there were none of the constitutional signs or symptoms such as are seen after the first or second prophylactic dose.

A further experiment was planned to test the blood-sera against standard O agglutination cultures of *Bact. typhosum*. For these, 8 patients were divided into two groups. The experiment was carried out as before except that the sera collected after intradermal injections were tested for agglutinins with the O cultures of *Bact. typhosum* supplied by the M.R.C. The results are shown in the table. It will be seen that they confirmed the earlier experiments. Injections into irradiated skin gave agglutination with O cultures of *Bact. typhosum* in dilutions up to 1/1000; the injections into normal skin gave agglutination up to 1/100.

IMMUNITY PRODUCED BY INTRADERMAL INJECTIONS OF T.A.B. VACCINE INTO NORMAL AND IRRADIATED SKIN. TESTS WITH STANDARD AGGLUTINATION CULTURES OF *BACT. TYPHOSUM* AND *PARATYPHOSUM* A AND B (H CULTURES) AND OF *BACT. TYPHOSUM* (H + O CULTURES)

Group	Sera	Dilution of cultures: 1/10	1/20	1/40	1/60	1/100	1/200	1/400	1/600	1/1000	1/2000	1/4000	1/6000	1/10,000
Bact. typhosum (H)														
1	1	..	−	−	−	−	−	−	−	−	−	−	−	−
	2	..	+	+	+	+	±	−	−	−	−	−	−	−
	3	..	+	+	+	+	+	+	±	−	−	−	−	−
2	1	..	−	−	−	−	−	−	−	−	−	−	−	−
	2	..	+	+	+	+	+	+	+	±	−	−	−	−
	3	..	+	+	+	+	+	+	+	+	+	+	±	
Bact. paratyphosum A (H)														
1	1	−	−	−	−	−	−	−	−	−	..	..	..	..
	2	+	+	±	−	−	−	−	−	−	..	..	..	..
	3	+	+	±	−	−	−	−	−	−	..	..	..	..
2	1	−	−	−	−	−	−	−	−	−	..	..	..	..
	2	+	+	+	±	±	−	−	−	−	..	..	..	..
	3	+	+	+	+	+	+	+	+	±	..	..	..	..
Bact. paratyphosum B (H)														
1	1	−	−	−	−	−	−	−	−	−	..	..	..	..
	2	+	±	−	−	−	−	−	−	−	..	..	..	..
	3	+	+	±	±	−	−	−	−	−	..	..	..	..
2	1	−	−	−	−	−	−	−	−	−	..	..	..	..
	2	+	+	±	±	−	−	−	−	−	..	..	..	..
	3	+	+	+	+	±	±	−	−	−	..	..	..	..
Bact. typhosum (O)														
1	1	..	−	−	−	−	−	−	−	−	−	..	..	..
	2	..	+	±	±	−	−	−	−	−	−	..	..	..
	3	..	+	+	+	±	−	−	−	−	−	..	..	..
2	1	..	−	−	−	−	−	−	−	−	−	..	..	..
	2	..	+	+	+	±	−	−	−	−	−	..	..	..
	3	..	+	+	+	+	+	+	+	±	−	..	..	..

Group 1 { Sera from patients receiving } normal skin.
„ 2 { intradermal injections of T.A.B. into } irradiated skin.
Sera 1, collected before injection.
Sera 2, „ 7 days after first injection.
Sera 3, „ 16 „ „ second „

SUMMARY

Exposure of the skin to ultraviolet rays diminishes the local reaction normally produced in allergic patients by scarification and the application of hay-pollen toxin.

Intradermal injections of hay-pollen toxin into an area of irradiated and erythematous skin of allergic patients excites violent symptoms and signs of hay-fever or asthma with collapse.

Intradermal injections of T.A.B. vaccine into areas of skin rendered erythematous by ultraviolet rays will provoke an agglutinin (H and O groups) titre in the blood-serum more than ten times as great as a similar intradermal injection into areas of normal skin.

The erythema reaction following exposure of the skin to ultraviolet rays may thus be used to increase local and general immunity.

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Reviews of Books

The Child's Discovery of Death

By SYLVIA ANTHONY, M.A. London: Kegan Paul, Trench, Trubner and Co. Pp. 231. 11*s.* 6*d.*

THIS study has, for its material, records taken by parents, and an ingenious story-completion test in which the examiner tells a standardised story presenting certain situations to the child which is he then asked to elaborate further. Both methods owe much to the advice and teaching of Professor Piaget and the story test was planned and first used in Geneva at the Jean Jacques Rousseau Institute. Numerous techniques have been devised to gain admission to the child's mind and his way of thinking and feeling, and telling a story which the child then takes on as his own is one of the best. It makes full use, of course, of the method of projection; most children identify themselves readily with the child in the story, and in describing his adventures they reveal much of the trends in their own fantasy life. Here the material was planned to give as much information as possible about the child's attitude to various aspects of death. It takes on a topical significance since so many children in the war have become vividly and personally aware of death. The story-openings never directly mention death but constitute invitations to the child to do so, and it is significant that "the most rigid scoring gave 46% for children who made such references in fantasy, 51% when we include those who made spontaneous references of some kind, and 60% was the number when ambiguous cases were included. Obviously it is impossible that children should think about death less than they speak about it . . . and the results certainly suggest that the thought of death comes readily to their minds."

Material gathered by direct conversation with children is apt to be enthralling when given direct to an observer and tedious when written; the work recorded in this book is no exception, and it is not always clear how the writer reached her conclusions from the material actually given. Nevertheless, such observations, directly made and carefully analysed, repay all the time spent on them since they retain their meaning for all time. The conclusions drawn by Miss Anthony challenge at certain points the theories of Freud in connexion with the child's death wishes and death instincts. Miss Anthony prefers to regard the child's concept, especially in the earlier years, as synonymous with the idea of separation, but she sees clearly in her material the outlines of a linkage between ideas about death and on the one hand aggressive fantasies, on the other anxiety and feelings of guilt. She admits that while the idea of death develops in the individual as his intellect advances his concept of death relates not only to this development, as an intellectual phenomenon, but exists as a close relationship between the deepest currents of emotion and intellect. Her conclusions are suggestive, and contain much of pedagogical value to parents, today faced with much that is difficult to explain to children. She rightly rejects both the attempt to shield the child from every damaging experience and the suggestions—often attributed to the Freudians and the "new" psychologists and the "free" schools—that the child should be encouraged in the free expression of all that is emotionally disturbing him. She recognises that children in developing and expressing fantasies concerned with an inevitable reality such as death are in fact making acquaintance with it. A failure to admit the power and the reality of death can only be achieved at the cost of neurotic mechanisms and subsequent anxiety. "We must recognise what will harm us, open our minds to it, welcome it, then weave it securely into the reality pattern which is ultimately ours."

Office Urology

By P. S. PELOUZE, M.D., assistant professor of urology in the University of Pennsylvania London: W. B. Saunders Co. Pp. 766. 50*s.*

Dr. Pelouze, who has taken an active part in the work of the American Social Hygiene Association, explains in his preface that his publishers asked for a textbook describing the methods of examination and treatment that could be carried out by a urologist in his own consulting-room. A glance at the ground plan of the "offices" used by urologists in the States will convince readers that American urologists are capable of a wider range of work than their British colleagues. Many of the procedures which would be considered routine office work across the Atlantic are impossible to consultants renting a single room in Harley Street. This, however, does not detract from the value of Dr. Pelouze's book. He has aimed at simplicity and common sense and has achieved them. His work is essentially practical and theory finds little place in it; and he never loses sight of the human side of his subject. In the chapter dealing with sexual problems he states that 99% of cases of impotence are due to psychological factors. A great many genito-urinary specialists are unfortunately of a different opinion; they stress the physical aspect at the expense of the psychological and apply a number of tinkering remedies which may have a suggestive value but are otherwise useless. Dr. Pelouze is not wedded to any particular school of psychology; he uses his native wit and uses it with good results. In the final chapter, a very long one, he discusses the all-important subjects of cystoscopy and radiography. Cystoscopy is now as routine a practice in the consulting-room of the urologist as is retinoscopy in that of the ophthalmic surgeon. It is perhaps a little surprising that although the suites of the American urologist include a laboratory they do not include an X-ray plant, for X-ray examinations are as important in the diagnosis of urological cases as laboratory investigations.

The book, like most American medical publications, is well and profusely illustrated.

Anxiety and its Treatment

By JOHN YERBURY DENT, L.M.S.S.A. London: John Murray. Pp. 124. 3*s.* 6*d.*

IT is not easy to see for whom this book was written. The author says that his object is "to describe the changes that take place in us when we are frightened, to be a warning against the usual treatment of fear—namely, anæsthetising ourselves against it with drugs or alcohol, which may produce addiction—and to show how such addictions may be cured." The book, however, is too technical for the layman, and makes little contribution to the scientific study of psychiatry and drug addiction. It is true that a large number of people are now exposed to terrifying experiences as a result of the war. These times of stress, however, are usually of short duration, and experience shows that few have any desire to "anæsthetise" themselves on these occasions; their chief concern is to keep their wits about them and take suitable precautions for the safety of their families. Mr. Dent says that it is impossible to write a book about anxiety without at the same time dealing with addiction to alcohol. This is a remarkable statement, and few practitioners will concede that alcoholism figures so prominently in their practices and least of all among patients suffering from anxiety states.

THE LANCET

LONDON: SATURDAY, APRIL 26, 1941

SALVAGE

THE number of men boarded out of the British Army in the first year of the war must be not far short of 100,000. Most of them are young men, under 30 years of age, and they probably suffer for the most part from such conditions as gastric and duodenal ulcer, mental and nervous disorders, rheumatism and rheumatic heart disease, disorders of the chest (including pulmonary tuberculosis), visual defect and foot disabilities. The army has a measure of responsibility for their medical care for 28 days after they are boarded out. Some of the men are awarded pensions, and their subsequent care is in the hands of the Ministry of Pensions, others do not get pensions and on return to civilian life are dependent for their treatment on ordinary civil resources. Most men boarded out of the Army require medical attention from their family doctor after discharge, and many require hospital treatment, which as things are they find more difficult to obtain after they leave the Army. Their treatment should be pressed home to secure the fullest possible degree of stable recovery, partly to prevent chronic invalidity and partly to make the most of them as producers. Reabsorption of these men into civil life does not always proceed smoothly; probably only about two-thirds of them are in employment six months after discharge, and of these only a minority are working at their old jobs, some of them intermittently. Most of those who find employment drift, generally at the dictate of physical necessity, into some form of light work which entails diminished earnings, or into some dead-end occupation which fails to harness their efforts to the best national advantage.

Some remain unemployed because they are unable to work on account of their physical condition; some have tried to do their old job and have broken down; some have tried light work and found they were unequal to it; some inevitably seem to be condemned to prolonged incapacity. In other cases continuing disability is associated with a development of the illness (e.g. bleeding or perforation of duodenal ulcer after starting work), or—a common source of trouble—inability to carry on at work on account of special food difficulties, common in war-time. In many cases the problem is one of securing work suited to the man's aptitudes and physical limitations, which may be general or local—as with a miner who has suffered from acute rheumatism, or a labourer from traumatic arthritis of the spine unable to get a job affording the necessary support to his back. Occasionally, failure to obtain work is due to some incidental—even stupid—cause, as in the foreman who was repeatedly refused employment because he had been "classed as unfit by a medical board."

It will not be possible to restore all these men to full working capacity, but there can be no doubt that if rehabilitation and reabsorption into civil life are striven for systematically, much can be done to reduce their incapacity, and here is a magnificent opportunity for the promised influx of new blood from America. With his flair for doing the right thing at the just moment Mr. ROOSEVELT has implemented the Red Cross appeal for 1000 male medical graduates from the U.S.A., under the age of 40 for service with the R.A.M.C., under 45 for service with the E.M.S. While retaining their status as American citizens they will become, in Mr. ERNEST BROWN'S phrase, an integral part of our own services. In this connexion the Minister of Health has also spoken of the overruling need that workers, whether in industry or in civil defence, should be restored as soon as possible to active life by skilled supervision and treatment. This is not a task for tired and listless men; the work of rehabilitation requires all the drive and initiative of an offensive campaign if it is to give results. It is not sufficient to tackle a few isolated groups, like the psychoneurotics: the problem must be approached as a whole, and at once. Its solution may well be the special concern of these New World crusaders.

TYPHOID PROPHYLAXIS

THE time is near when the chemist will extract from cultures, or perhaps synthesise, clearly defined chemical substances which will confer sound protection against the enteric group of fevers. But these substances are not yet available; and meanwhile the engrossing saga of antigenic analysis grows. The official medical historian of the Great War was of opinion that, just as the typhoid vaccine then employed was superior to that used in the South African War, in like measure would the vaccine of the future surpass in protective value that of 1918. Between 1925 and 1930 there arose a general recognition of the importance of the somatic O agglutinin as a measure of the immunity attained and the relative unimportance of the flagellar H agglutinin. Next, owing to the work of GRINNELL[1] in the United States in 1932 and PERRY, FINDLAY and BENSTED[2] of the R.A.M.C. from 1933 onwards, realisation came that the degree of protection conferred by a vaccine was closely related to the mouse-killing power or "virulence" of the culture used to prepare it. These workers thought that the exaltation of virulence and therefore of the protective capacity of a culture passaged through animals might depend on the presence of an antigen elaborated during passage. FELIX and his colleagues elucidated this conception in 1934 by their estimations of the antigen and agglutinin related to virulence, which they called Vi. Of late years cultures rich in Vi have been selected for the production of T.A.B. vaccine for the British Army. A new series of papers by FELIX[3] and his collaborators may herald a new development.

The agreed aim of all vaccine makers has been to retain as much as possible of the O and Vi antigens in the finished vaccine. BENSTED[4] in his Harben lectures referred to the observation by FELIX and PITT in 1934 that phenol, the preservative used in the Army vaccine, reduced the agglutinogenic value of the Vi antigen. BENSTED found the immunising power of this vaccine, as judged by mouse-protection tests, unimpaired, and he said that other preservatives could be devised which left the agglutinogenic power unaltered. FELIX goes further; his work leads him

1. Grinnell, F. B. *J. exp. Med.* 1932, **56**, 907.
2. Perry, H. M., Findlay, H. T. and Bensted, H. J. *Jour. R. Army med. Cps*, 1933, **60**, 241.
3. Felix, A. *Brit. med. J.* March 15, 1941, p. 391.
4. Bensted, H. J. *J. R. Inst. publ. Hlth*, 1941, **4**, 7.

to conclude that the ability of a vaccine to confer protection on mice against lethal doses of typhoid bacilli injected parenterally is not a full measure of what is wanted to protect man. A vaccine which contains undamaged Vi antigen, and will produce in immunised rabbits a serum conferring high passive protection on mice against the injection of bacilli, would be superior to that now in use. He has succeeded in this object by killing the culture—chosen for its ample content of Vi antigen—with 75% alcohol, and by using 22·5% of alcohol as a preservative. He established that this vaccine produces Vi agglutinin in rabbits. Three doses, 8000 million organisms, were then given to 50 mental patients. The injection of the alcohol-killed vaccine doubled the O agglutinins in 49 of the 50 patients and the Vi titre in 24 of them. The reactions were much less severe than those following T.A.B. An alcohol-killed vaccine, preserved in the usual way with phenol, when stored for six months in the cold room, lost the power to generate Vi agglutinin. FELIX found that a 22·5% solution of alcohol preserved for at least nine months that part of the vaccine which generates Vi agglutinins after intravenous injection into a rabbit. It was similarly shown that the strains of *Bacterium paratyphosum* A and B to be chosen should contain maximum amounts of O and Vi antigens. Oddly enough, phenol-preserved A and B vaccines do give rise to Vi agglutinins. BENSTED in 1937 found that estimation of Vi agglutinins was a more sensitive test of virulence than the mouse test unless very large numbers of animals were used. FELIX has chosen for making T.A.B.C. vaccine four new strains selected for their ability to produce a maximum amount of Vi antigen.

FELIX and his collaborators have made further investigations in man.[5] Their hope was that the alcohol-killed and alcohol-preserved vaccine would cause the production of Vi agglutinins, and that was to be the criterion of value. Experiments were designed in which small groups of people received the vaccine killed and preserved with alcohol, while comparable groups received either vaccines killed with alcohol and preserved with phenol or the ordinary heat-killed phenol-preserved T.A.B. There were 84 people in the first group and 228 in the control groups. The Vi content of the blood-serum obtained immediately before and about a fortnight after the final dose was determined. Of the 84 receiving the new vaccine, 33 (39·2%) developed a Vi-agglutinin titre double that of the pre-vaccine stage, whereas only 13 (5·7%) of the 228 who received vaccine preserved with phenol, whether killed with alcohol or heat, showed a similar rise. All the vaccines produced a large increase of O agglutinins. A point of considerable administrative importance is that the local reactions with the new vaccine were milder than with T.A.B. Among 210 inoculated nurses only 3 had to go off duty. The Felix vaccine offers high promise. There the matter stands at present. Whether the medical authorities responsible for the health of the three services should adopt the new vaccine will require cautious deliberation. There can be no doubt in the mind of the ordinary observer that Army vaccine, about which we have more complete records than probably any human prophylactic bacterial vaccine, has given high protection. Those who saw how the British troops lived unscathed near the typhoid-stricken villages on Kim's Grand Trunk Road north of Lahore need no convincing. The figures quoted by BENSTED, too, are impressive. Between 1929 and 1936 the incidence among British troops in India fell from 4 to 1·5 per thousand, while among the unprotected civil population in India the incidence rose. The "heat-killed phenol-preserved rejuvenated Rawlings" typhoid vaccine has passed the acid test of extensive trial in the field, and in the midst of war a tried friend is not readily jettisoned.

5. Felix, A., Rainsford, S. G. and Stokes, E. J. *Brit. med. J.* March 22, 1941, p. 435.

THE BIOLOGICAL APPROACH TO MENTAL DISORDER

PSYCHOTHERAPISTS have lately shown in our correspondence columns that they dissent from the proposition that there is no justification for psychotherapy as a special branch of medicine. This is not surprising; and that they should have stated their dissent with some vehemence is likely to surprise only those who expect from the psychotherapist in ordinary life (and when discussing psychology) the unemotional detachment which he must maintain during therapeutic interviews. The proposition as stated is in itself likely to have the approval of most doctors nowadays who look at the matter dispassionately; there is no need to turn any form of treatment into an independent branch of medicine, least of all while its theoretical basis is insecure and the principles of its application still controversial. A more difficult issue arises in deciding what training is most likely to make a doctor efficient in the treatment of neuroses. Group Captain SYMONDS, in his lucid and comprehensive address, put forward the view that neuro-psychiatry is one subject, and that the neurologist and psychiatrist have common interest and duty in the field of the neuroses; consequently that training in these two departments is proper for those who would be expert in the treatment of neurotic patients. This, which may be called the orthodox view, is supported by the practice of most European countries, and by authority such as that of ADOLF MEYER, who said, also in a presidential address,[1] that a unified neuropsychiatry does not mean any submerging of either neurology or psychopathology: "there will but rarely be physicians who can cover the whole field, and each investigator will have his own choice of problems. But one thing is certain: we do demand of everyone a reasonable training in the *entire domain*, including the functions constituting the personality. We want neuropsychiatrists—not merely neurologists and not merely psychologists, but primarily physicians able to study the entire organism and its functions and behaviour, and more especially the share of the nervous system and of the general problems of adaptation." When this aim has been realised in a greater number of neuro-psychiatrists than at present the controversy about medical psychology as an independent subject will wear an unreal aspect. Much ignorance of neurology, and, still worse, of psychiatry, will never be compatible with mastery of that part of psychological medicine specially concerned with treatment. It has been urged that knowledge of general medicine is at least

1. *Arch. Neurol. Psychiat. Chicago*, 1922, 8, 111.

as important for the psychiatrist as knowledge of neurology, since mental disorder can lead to visceral symptoms such as dyspepsia. Insofar as this is an argument for good training in general medicine, none would gainsay it; neuropsychiatrists should be competent physicians. But it is well to consider that the visceral symptoms in question are themselves produced through disorders of nervous control, and that for their full understanding much (including metabolic and physiological knowledge) that is prominent in neuropsychiatry is necessary. There is little need for controversy here. The war has created a situation in which the disadvantages of being a neurologist without psychiatric experience or a psychiatrist without any neurology have become plain. For the lions and the lambs have had to turn to on much the same tasks. In these circumstances the medical psychologist who has only his medical psychology to help him is a man set apart for compassion. He walks among perils blindfold, and sees missed opportunities on every side. What he knows how to do he cannot now do; and what he is untrained in he must daily perform. He must diagnose; he must speak and write plainly; he must admit his failures; and, hardest of all, he must treat summarily. Those whose preoccupation with psychotherapy has not prevented them from obtaining a solid training in neuropsychiatry do not find themselves now in a predicament here. It will be fortunate if the present broad organisation of neuropsychiatric work has the effect of demonstrating beyond further argument the need for knowledge of the whole subject before limiting oneself to practise of one form of treatment; it may put an end to the use of that specious short cut whereby a man undertook a training in medical psychology by and for itself, and so was in danger of falling into ways that were a travesty of sound medical treatment.[2]

VEGETABLES FOR THE NATION

MALNUTRITION in peace-time is primarily caused by poverty, less often by ignorance. A good mixed diet will supply most of the essential protective elements, and a dietetic analysis is usually only important for the sick or the poor. In time of war, however, a restricted supply of foodstuffs may mean omission of vital factors and the entire nation may be affected. At the moment, within limits, we can draw on meat, fish, milk and sometimes cheese for our protein; margarine and butter for fat and vitamins A and D; milk, meat, eggs and vegetables, for mineral salts. Carbohydrate can be supplied by our daily bread, and, if this is taken in the form of a Government standard or wholemeal loaf, vitamin B_1 is available in it. But at a meeting of the food group of the Society of Chemistry and Industry on April 9, under the chairmanship of Sir JOHN RUSSELL, the possible lack of vitamin C in war-time was emphasised during a survey of the nutritional value of vegetables. Plant tissue is the only significant source of vitamin C in human diet, and even in normal times the absence of fresh fruit throughout winter and spring means that vegetables must contribute largely towards the daily requirement of this vitamin. Canned fruits, jams such as black-currant, and in recent years cheap imported fruits such as oranges and lemons, help materially in meeting this deficiency, but with present restrictions nearly the whole supply of vitamin C during the winter months must be contributed by vegetables.

Not all vegetables, however, are valuable antiscorbutics, and carrots, for instance, are more useful for their pro-vitamin A (carotene) content, and onions for their flavouring properties, than for the ascorbic acid they contain. In addition to being important sources of carotene, green leafy vegetables such as kale, spinach, cabbage and sprouts are extremely rich in vitamin C, as are also the flower-head vegetables such as cauliflower and broccoli. Potatoes are valuable antiscorbutics when freshly dug throughout the summer or early autumn, and a normal serving (4 oz.) of the cooked vegetable may provide the probable minimum daily requirement (30 mg.) of the vitamin. Storage, however, results in a fall of the vitamin-C content of root vegetables, so that by March and April probably only about 6 mg. is obtained from a normal serving of boiled potato. This is unfortunate, since it is at this period of the year that there is the greatest deficiency. Either the consumption of potatoes and other root vegetables must be increased[1] or more use must be made of green vegetables, which are even more valuable antiscorbutics than freshly lifted potatoes. Again storage should be avoided, since shop-purchased green vegetables may have only 50% of the vitamin-C content of those freshly picked. Home growing of green vegetables for winter and spring use is wise because the time lag from plant to pot is reduced to a minimum. The canner ordinarily has the advantage over the housewife in this respect and is able to market a cooked vegetable which is usually of greater antiscorbutic value than "fresh" ones cooked at home. Greens at meal times are too often presented in an unappetising sodden mass. The housewife can do her share in preserving national health if she cooks greens appetisingly and in such a way that they retain as much vitamin C as possible. Destruction of ascorbic acid during the boiling of green vegetables is small[2] but much of the readily soluble vitamin may be lost in the cooking water. At the meeting cooking for a short time only was advocated, with the use of the vegetable water in soups and gravies. Green vegetables should be eaten immediately after cooking and not kept hot, for about half the vitamin C may be lost by keeping green vegetables hot for only 30 min.—a fact of great importance in large-scale catering. Canners are already playing their part by using carefully controlled methods of cooking. Is it too much to hope that similar control will be exercised in the household and that a triumvirate of doctor, householder and housewife—advising, digging and cooking for victory—will keep us fit?

1. Olliver, M. *Lancet*, 1940, **2**, 190. 2. *Ibid*, **1**, 1129.

2. It is timely to recall the admirable series of papers on this topic by neurologists and psychiatrists in the *Archives of Neurology and Psychiatry*, 1933–34, **29–32**, and in the Proceedings of the 4th Conference on Psychiatric Education at Baltimore, 1938.

On April 28, at 2.30 P.M., Mr. G. Stafford Whitby, D.Sc., director of the Chemical Research Laboratory at Teddington, will deliver to the Royal Society of Arts two Mann lectures. He will speak on chemotherapy and the second lecture will be given on May 5. On April 30, at 2.30 P.M., Lord Dawson will take the chair, when Dr. O. R. Tisdall will read a paper on the general practitioner and scientific thought. On May 7, Major-General Sir John Kennedy will address the society on the Red Cross in war.

Annotations

SEED AND SOIL IN CANCER RESEARCH

THE 38th annual report of the Imperial Cancer Research Fund presented by Prof. H. Roy Dean on Wednesday last gives the lie to the idle chatter that research must give place to some more practical form of war effort. What is modestly but misleadingly called a research fund is one of the best conceived research institutes in the world and Dr. W. E. Gye, the director, would carry on though the sky fell. Short though the report is it contains a cross-section of modern trends of thought about the origin of cancer. Mention of one or two of these trends must suffice. The discovery of the link between bacteria and disease came as such a revelation that it led inevitably to an oversimplification of the relation between the two. A belief—almost mathematical—grew that bacteria plus man equalled disease. It was not till 1919 (as set out in the fund's 6th scientific report) that this idea was disproved by experiment. Arising out of the irregular incidence of gas gangrene in France it was then shown that the pathological activity of the spores of some anaerobic bacteria was subject to certain specific conditions. Spores alone, though injected into muscle, were not pathogenic in mice; they required help in the form of calcium salts or certain colloidal suspensions to overcome the defences of the body and to release their power to do harm. The lesson that pathological action is conditioned is now being learnt once more in experimental cancer research. Whether one puts one's faith in a filtrable agent or a chemical substance as the ultimate cause of cancer it is not true to say that a cell simply combines with this or that agent to cause cancer. In the first place we know beyond a doubt, from those forms of cancer in which a filtrable agent has been found, that this agent must first get into the cell, and into the right cell in the right kind of animal. This may be no easy matter even for an ultramicroscopic particle of foreign origin, unless the door is unlocked for it. As far as we know unlocking the door means creating a state of affairs that causes cells of the right kind to grow—that is to say, to multiply. It is possible to create such conditions at will in tissue cultures outside the body. If to such a culture of the right kind of cell the right kind of agent is added, that cell becomes potentially malignant. If, after thorough washing, it is next inoculated into an animal of the right species a tumour will grow having all the properties of those that occur spontaneously. But if the particular cell has the wrong filtrable agent added to it or if an inappropriate cell is used and the wrong kind of animal receives the implant then no tumour will develop. It might be thought that the same conditions would apply to a combination of cells and chemical carcinogenic agents in glass tubes outside the body. The report before us shows how Dr. R. J. Ludford has failed to produce a tumour by implanting cells treated for long or short periods with carcinogenic chemicals. So far as they are known the conditions for the success of such an experiment were observed. The treated cells were derived from mice of a pure strain, and were subsequently injected into other mice of the same strain. Thus any check on growth due to antigenic properties of the treated cell was avoided. This means that the exact conditions needed for a normal cell to be changed into a malignant one by chemical agents are as yet unknown.

Just as the experimenter seeks to know exactly how a normal cell becomes a malignant one so he seeks the best conditions for an attack on it once this transformation has come about. Dr. Gye wisely notes that there are grounds for hoping that the cure of cancer should some day be possible along Nature's own lines. From time to time reliable reports appear of spontaneous cure in human beings, and more often experimental tumours regress in animals. It has been noticed by Kidd that when several disappear in one animal they do so at the same time. Presumably this could happen only if something which opposed the tumours were to reach all simultaneously. This could be achieved through the blood-stream. In order to test the idea that a circulating tumour poison accounts for this kind of regression, Drs. Purdy and Ludford performed a simple experiment. The Fujinami myxosarcoma nearly always regresses when grown in ducks. At the time when one of these tumours had just begun to regress plasma was taken from the host and made to serve as a culture medium for transplants in glass tubes from yet another duck-grown Fujinami tumour. The idea was that the plasma might oppose growth of the implanted cells. This it failed to do. The conditions for successfully attacking malignant cells seem to be as exacting as those that allow them to acquire this disease.

BONE-GRAFTING THE SCAPHOID

THE treatment of fractures of the carpal scaphoid has always been a ticklish and somewhat ungrateful problem for the orthopædic surgeon, who has not in the past been repaid by uniformly successful results. Promise of an advance in the management of certain types of fracture is welcome therefore to surgeon and patient alike, for the latter has often had to submit to long periods of immobilisation, not always followed by union. In this issue Squadron Leader Armstrong describes a new technique for bone grafting certain selected cases which has met with some success. Cases may be differentiated into four main groups, corresponding to the period since injury and the degree of vascular disturbance. There are the earliest, seen after a few days; those seen after some weeks or months, with delayed healing but no evidence of non-union; then the cases of established non-union with sclerosed fracture-surfaces; and finally those where avascular necrosis of the proximal fragment has followed severing of its blood-supply. In the first group union may confidently be expected to follow really adequate plaster immobilisation until there is radiographic evidence of union, a period of 8–12 weeks in the majority. In the last, it is generally agreed that nothing is to be gained by either fixation or reconstruction—the patient carries on with his work if this is light; if he is a labourer he has one or both fragments excised to forestall subsequent arthritis, or, if that has already supervened, he may need an arthrodesis of the wrist. Armstrong is concerned with the treatment of the two intermediate groups, about which there is still discussion. So far, the only absolute indication for bone grafting or drilling has been the existence of established non-union without evidence of avascular necrosis—an uncommon finding—and Watson-Jones[1] would limit the operation strictly to this type. He holds that the simple case of delayed union will nearly always unite if sufficiently immobilised, and that when union follows grafting in such cases it is due to the accompanying period of fixation; hence the risk of necrosis following operative stripping should not be incurred. But Armstrong pleads for the extension of the operation to this type of delayed but not yet ununited fracture. Agreeing that union would probably follow long enough immobilisation, he demonstrates the difficulty of absolute fixation if the fingers are to be left free and the excessively long periods often required, and he avoids the dangers of postoperative necrosis by the adoption of what is virtually a closed method. This method has been developed and applied to cases not strictly fulfilling Watson-Jones's criteria primarily to meet the needs of Service patients, where long fixation is undesirable; but the favourable results warrant trial in less urgent circumstances. Before undertaking operation it is essential to

1. Watson-Jones, R. Fractures and other Bone and Joint Injuries, Edinburgh, 1940, p. 416.

have a thorough appreciation of the position and lie of the scaphoid in the carpus and to adopt standard radiographic views. Positions for true lateral and postero-anterior views are based on the fact that the long axis of the bone lies in the vertical plane and at 50° to the perpendicular when the wrist is held palm upward, pronated to 45°, and with the hand in the neutral position. At operation the limb is so held on a special rest and a drill is introduced through a ¾ in. incision over the lateral aspect of the tubercle, passing in the line of the axis of the bone centrally through both fragments. After radiographic check the drill is removed, a tibial peg inserted and the wound closed. There is no exposure or stripping and after 7 days in a padded plaster the usual skin-tight plaster is retained until there is evidence of union. The method must be carefully studied if avoidance of damage to articular structures and accurate insertion are to be achieved; but the results are encouraging. If successfully repeated in other hands it may represent an advance as important as the progress from open to closed nailing of the femoral neck.

SACRAL ANÆSTHESIA IN OBSTETRICS

In spite of many recent advances in analgesia and anæsthesia for obstetric practice the search for perfection still continues. W. H. Poole[1] has reported the results he obtained when using sacral nerve block. This method of anæsthesia is by no means new in obstetrics, for both S. P. Oldham[2] in America and St. J. Wilson in this country[3] commented favourably on its use in selected cases. It is not a synonym for a low spinal anæsthetic; the spinal cord terminates at the level of the lower end of the first lumbar vertebra and the dura mater is prolonged as an ensheathing membrane to the cauda equina as far as the third piece of the sacrum. The dura is firmly attached anteriorly to the vertebral bodies but posteriorly is surrounded by loose areolar tissue filling the epidural space. This potential space extends to the level of the first coccygeal vertebra and varies in size; its capacity may be 25–50 c.cm. or more. The contents of the space are fat, areolar tissue, a venous plexus, and the obliquely directed nerve roots of the cauda equina, the terminal 1–1½ in. of which are devoid of dural envelope where they traverse the space; they are therefore accessible in this part of their course to the effects of any drug injected into the epidural tissues. The needle can be introduced in the hiatus between the last sacral spine and the first piece of the coccyx; the hiatus is ¾ in. long by ½ in. wide and is guarded by the posterior sacrococcygeal membrane. A fine lumbar-puncture needle is used and the bony landmarks carefully defined, especially in an obese patient. The subject lies in the left lateral position and the tip of the coccyx is marked; 1½–2 in. above this the transverse processes of the first coccygeal vertebra are felt and superior and lateral to these the more prominent sacral cornua. Just below these lies a diamond-shaped depression like a miniature fontanelle marking the sacral hiatus. The posterior sacrococcygeal membrane lies 3–12 mm. below the surface. Having pierced the membrane the advancing needle impinges on the bony anterior wall of the canal; it is withdrawn and guided about 1½ in. up the canal. Neither blood nor cerebro-spinal fluid should escape from the needle, and no resistance should be encountered to the injection of the anæsthetic. Poole made several experiments to determine the best solution for injection and after a trial of 2% procaine with 3% quinine and urethane, 2% procaine only, and 1 in 1000 Percaine in aqueous solution, he rejected them all because of the brevity of the anæsthesia. Instead he used 1 in 1000 percaine in normal saline in dosage of 25 c.cm.; this gives anæsthesia lasting at least 4 hours and often longer, of sufficient depth to allow the application of forceps in the low operation and the repair of the perinæal tears. Any obstetric anæsthetic is required for two main critical periods of pain; that accompanying the later stages of cervical dilatation and that produced by the final stretching of the soft parts of the pelvic floor. If carefully timed sacral anæsthesia will successfully relieve both these painful crises, but it must not be employed too late for the first nor too early for the second. In primiparæ the optimal time for injection is towards the end of the first stage of labour, in multiparæ naturally at an earlier stage. The immediate results of a successful injection will be a decrease or even cessation of uterine contractions; this is a transient action lasting about half an hour, and provided the pains were previously strong and regular they will return with equal vigour. Inefficient uterine action, as in primary inertia, is an absolute contra-indication to this method of anæsthesia. Poole analyses his results critically in 32 cases in which he has used sacral nerve block. He assesses his failures at 10 cases with the following causes: faulty technique in 3, too early administration in 2, and inefficiency of uterine action after the injection in 5. All these failures with attention to technique and careful selection of cases could have been eliminated. No ill effect in the mothers or the babies could be blamed on the anæsthetic. Sacral nerve block will no doubt have its critics; the English surgeon is averse from using regional in preference to general anæsthesia, but it is to be hoped that more obstetricians will try for themselves a method that has obvious advantages at least from the fœtal point of view, because of the avoidance of cardio-respiratory depressants in the circulation. Should the occasion arise for a major obstetric procedure it is a simple and safe matter to supplement the regional with a general anæsthetic, the total dosage of which will be proportionately smaller and consequently less toxic.

1. *J. Obstet. Gynæc.* February, 1941, p. 84.
2. *Anæsth. Analges.* 1927, **6**, 192. 3. *Lpoolmed.-chir. J.* 1931 **39**, 138.

AN ACUTE FORM OF CHAGAS'S DISEASE

It is 30 years since Chagas noted the probable connexion between trypanosomiasis and a chronic form of myocarditis prevalent in South America. That more acute manifestations may result from trypanosome infection is suggested by investigations made by the staff of the section of parasitology of the Montevideo Institute of Hygiene[1] on children in Uruguay. The number of acute and subacute cases collected was 165, of which 6 are selected for detailed description, as typifying different forms of the disease. In all of these the diagnosis was established by the demonstration of the parasite either in the patient's blood or in the nymphæ of the specific vector (*Triatoma infestans*) after they had been allowed to suck blood from the patient. A girl of seven and a boy of nine suffered from acute parasitic myocarditis, confirmed by autopsy in the girl, who died after an illness of four weeks; the boy was successfully treated with 7·602, a quinoline derivative which appears to exert a specific influence on trypanosomes present in the circulation and so indirectly reduces the number embedded in the tissues. In another patient, a girl of ten, the illness ran a course resembling typhoid fever. Five injections of 7·602 were given and the child recovered after six weeks. A boy of five suffered from acute thyroiditis, from which he recovered after receiving ten injections of 7·602 on alternate days. In the fifth patient, a boy of eleven months, there was acute gastro-enteritis; he was treated with Stovarsol and emetine and recovered. The sixth case was less acute; the patient, a girl of seven, showed pronounced bilateral dacryoadenitis and generalised enlargement of the lymphatic glands. From the point of view of diagnosis, important signs are dacryoadenitis, which may be unilateral or bilateral, and which was noted in 4 of the 6 cases described, including

1. Talice, R. V., Rial, B. et al. *An. Fac. med. Montevideo*, 1941, **15**, 1023.

the case in which it was the chief manifestation of the disease; œdema of the face; leucocytosis with high mononucleosis; enlargement of the liver and spleen; and generalised lymphadenitis, observed in 5 of the cases. The diagnosis is rendered certain by one or other of the laboratory tests for the parasite. In the one case in which post-mortem examination was possible, confirmation of the specific character of the myocardial lesions was obtained by the discovery of "nests" of leishmania embedded in the fibres of the heart-muscle, which also showed areas of acute inflammatory infiltration and degeneration. None of the other organs examined showed evidence of the organism. No light is thrown by this new work on the exact nature of the associated lesions or the enlargement of the thyroid to which Chagas himself drew attention.

DECIPHERING CHARRED DOCUMENTS

IN these days of wholesale burning of books and records there is an increasing demand for improved means of rendering charred documents legible. From the Metropolitan Police Laboratory at Hendon comes a preliminary account of what seems to be a promising new method.[1] The document is treated with a 25% alcoholic solution of chloral hydrate and dried at 60° C. This process is repeated several times, and for the final application a similar solution containing 10% glycerin is used. The document is then photographed on a contrasting non-colour-sensitive plate. The method is fairly quick, is applicable to any type of document—printed, typewritten or, with modifications, handwritten—and requires no apparatus other than a copying camera. Judging by the example given, it is extremely effective, and Taylor and Walls say they have not yet failed to produce a readable result. This clarifying action of chloral hydrate has so far eluded explanation, but researches on this and on the allied problem of rendering the burnt document less brittle are proceeding.

PROSPERITY AND WEANING

THE subject of weaning excites warm opinion from time to time. For nearly forty years welfare centres and clinics have been preaching the value of breast-feeding up to the age of nine months, and their evangelism deserves, by this time, a hundred per cent. of converts. Yet we are often told that whereas the working-class mother is willing to do her duty in this way, the woman in more comfortable circumstances is generally anxious to get rid of the burden and put her baby on the bottle. An analysis of cases at Liverpool shows that neither of these pictures is true; and, moreover, that a nursing mother needs more than a willing disposition to achieve breast-feeding for nine months. Dr. Margaret Robinson[2] has compared breast-feeding in ten classes of the population by examining the records of 5838 nursing mothers attending the clinic at Norris Green New Housing Estate, Liverpool, over the 10 years 1930–1939 inclusive. These cases have been classified according to the profession of the father of the child, the ten groups being: professional, clerks, civil servants, Services, skilled workers, labourers, motor-drivers, unemployed, semi-skilled and shopkeepers. She notes what proportion of children were weaned in each group during each of the following periods: the first month; the second and third months; the fourth to the seventh month; the eighth month and over. There is remarkably little variation between the different groups. The percentage weaned in the first month ranges from 31 (clerks) to 39 (civil servants); in the second and third months the range is from 22 (motor drivers) to 29 (semi-skilled and unemployed); in the fourth to the seventh month the range is from 13 (motor drivers and semi-skilled) to 16 (clerks, Services and shopkeepers); and in the eighth month or over, from 20 (civil servants) to 29 (labourers and skilled workers). In short, about a third of mothers gave up feeding their children in the first month, and about a quarter kept it up until the eighth month or later; and the professional status of the husband had little bearing on these figures. In a further analysis, however, Dr. Robinson throws some light on reasons for weaning. The weaning times in three of the groups—unemployed, labourers and skilled workers—have been compared year by year through the decade; every year the highest proportion of infants weaned during the first month occurred among the unemployed—a finding which suggests that the yield of breast milk in the first month is diminished among the wives of men on subsistence allowance, though there are other factors which make breast-feeding difficult in a poor home, and some mothers may have been getting their baby on the bottle so that they would be free to go out to work. The same table shows a gradual decline in breast-feeding in all these three groups over the period studied, presumably in spite of continued infant-welfare teaching. No explanation is offered for this decline, but the figures for the unemployed group suggest that declining prosperity and nutrition during the pre-war years may have had some part in it; the fall in unemployment and the new milk scheme may change this trend.

CONTROL OF TYPHUS

THE Madrid correspondent of the *Times* reported on April 3 that there had been some 300 cases of typhus fever with 27 deaths, including those of 2 doctors, in the city, and that 20–30 new cases were being diagnosed daily. The disease was said to have broken out also in Murcia, Granada, Seville and Almeria. Vigorous action on the usual lines—disinfection, delousing and isolation of suspected persons—was proceeding in Madrid, and it may be hoped that control will be established before the epidemic extends more widely. A specific vaccine against typhus in quantities sufficient for extensive application in the field is at last within sight with the discovery by Cox[1] of the U.S. Public Health Service that the yolk sac of the developing chick embryo is an excellent culture medium for the pathogenic rickettsiæ, and his demonstration[2] that such a rickettsial culture, killed by phenol and formalin, produces on injection into guineapigs a high degree of active immunity to epidemic (European) typhus in these animals. The quantities available are of the order of 100 c.cm. from a dozen eggs, sufficient for the prophylactic immunisation of 30 people. No figures are yet available as to the efficacy of the Cox vaccine in the human subject. Nor will they be easy to get, since the conditions are rare in which vaccination must be relied on instead of the prevention of infection (by disinfection methods and so on), or in which opportunities for infection of vaccine-protected and vaccine-unprotected people are anything like equal. The failures of vaccine protection, if they occur, will therefore be conspicuous, while the successes will not be easily estimated. But the evidence from exposure to laboratory infection, combined with the experimental results in animals, justifies the belief that the vaccine will give adequate protection on exposure to the disease in the ordinary way. Though it is very unlikely that typhus will appear and spread with us in present conditions, it is good to know that the means of specific protection are at hand, and that the risks which are run especially by doctors, nurses and sanitary officers in dealing with the disease can be effectively countered.

We regret to record the death in London by enemy action of Dr. W. M. SCOTT and Dr. FREDERICK GRIFFITH, medical officers of the Ministry of Health and pathologists of world-wide reputation.

1. Taylor, W. D. and Walls, H. J. *Nature, Lond*, April 5, 1941, p. 417.
2. *Arch. Dis. Childh.* March, 1941, p. 31.

1. Cox, H. B. *Publ. Hlth Rep.* Wash. 1938, **53**, 2241.
2. *Ibid*, 1939, **54**, 1070; **55**, 110.

In England Now

A Running Commentary by Peripatetic Correspondents

THERE used to be a belief that the primary function of a hospital was to treat its patients. Even before the war indications were visible of an ever-increasing zeal for hospital records and the analysis of all sorts of hospital experience. The uninitiated might have imagined that the events of war would lead to some slowing of the clerical machine, and there were a few months during which the machine was so overcome by its own troubles as to have but little potential for crabbing others who were trying to get on with their work. But the respite was brief and a new and bigger army of accountants, auditors, administrators and miscellaneous overseers, has arisen to keep constant watch in triplicate over all our destinies. Nemesis again stalks the unwary. Someone inquires petulantly why two packing cases sent to the hospital eight months previously have not been returned to their home, and refuses to be comforted by the most solemn of protestations that the missing boxes were, in fact, sent back immediately they were unpacked. Someone else discovers that before the hospital was opened at all one therapeutic preparation was issued in error for another and insists that the first should be returned despite our assurance that it has long been consumed. Yet another discovers from the official records that somebody at the hospital seems to have ordered an electric fire, for which no authority has been vouchsafed, regardless of the fact that if we had waited until authority was vouchsafed for everything that was needed or sought we should have spent weary months in prayer that the onset of the real war might be long delayed. Much of our elaborate ritual centres round food, not merely the total cost of food consumed in the hospital but a detailed analysis of the consumption of different types of food and of the relative hungriness of patients and staff. It is not enough to demonstrate that our cost of eating is 1*s.* 9*d.* per day. We must also bring it to light that that inclusive figure is derived from x patient-days at 1*s.* 11½*d.* and y staff-days at 1*s.* 7½*d.* and to show that milk consumption per patient costs a pence per day and that for staff β pence per day, and why. We solemnly calculate all these minutiæ, knowing full well that in time Big Business will compare our figures with those for other hospitals and will point out to us respects in which our experience is worse than certain others, without remembering to tell us of any compensatory experience, sometimes without even any appreciation that the things that are being compared are quite incomparable. Sometimes we enlighten Big Business, sometimes not; but we often do feel tempted to remind it that there may be something wrong with an assumption that, because a hospital consumes more of a given quantity of a certain commodity than another hospital there is some laxity or worse in its administration. A zeal for analysis and standardisation is doubtless not in itself bad, for it is after all a fundamental attribute of the official mind, but it is often pursued to a point that is not good for the efficiency of its victim, nor yet necessarily conducive to true economy. Sometimes it may raise problems for its sponsors. On one occasion it happened that a baby was born in our hospital, where no good baby should be, and for long we professed to be uncertain whether to take cognizance of the new arrival in calculating the cost of our daily bread, or whether to carry it on the strength of the regiment. Our nobler instincts prevailed. The baby did not appear either on our patients' register, or, so far as we are aware, on any of the forms on which have to be recorded in triplicate new admissions to the hospital. Doubtless, sometime someone will catch a glimpse of the unfortunate child through an overlooked entry on a prescribed return and we shall be called on to explain why this patient was admitted without the prior authority of the hospital officer and whether the necessary inquiries were made to see how much should be recovered in respect of the patient's board and lodging.

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And then there are auditors. No self-respecting machine would be complete without auditors, though there may be some little doubt about what they are expected to audit, or about the knowledge of hospital technicalities they can hope to bring to their task. Auditors recently visited us, three strong, and took up their winter quarters for a period of five weeks, filling up in the course of that time many sheets of paper and apparently satisfying themselves on many points. We gathered that they wished our accounts to be kept after a different fashion—what really competent auditor does not?—but they did not seem to have reached any notable uniformity of opinion as to the form that should be adopted, though we have an uneasy feeling that the forms will be multiple and, doubtless, in quadruplicate. Our auditors soon discovered that the linen room was the warmest part of the hospital in these wintry days and spent many happy hours there counting sheets before arriving at the conclusion that the total was as matron had shown it to be. We were not so fortunate in relation to tea-spoons, for it appeared that several of these were missing, which is not surprising in view of the fact that many have been recovered more or less fortuitously from the packs of patients leaving the hospital, and at least one has been seen to walk out with a concert party. It is instructive to watch an auditor trying to count artery forceps, and especially different types of forceps; and there are many other items of equipment with which the genus can scarcely be expected to be familiar at this stage but of which he will doubtless acquire a sound working knowledge in the near future. There are many instructions governing the practice of any who would administer a hospital such as ours, some of them amusing, some mercifully mutually contradictory and a few just plain unmitigated nuisances, but that is probably inevitable, and when we think, as we often do, that life has become unduly formulated and that we are in danger of being suffocated by a multiplicity of official behests and returns we remember that we are not alone in our misfortunes and that our woes pale into insignificance with the trials that beset the righteous when the Army takes measles.

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Conflicting claimants have notoriously distorted judgments, and even in hospital it may be difficult to reconcile conflicting views on relative importances. It is not merely that there is diversity of opinion as to the relative importance of persons and duties, for such differences are commonplace in every sphere of human activity, but hospital life sometimes throws into relief the most extraordinary ideas about the importance of things. In a hospital which shares military and civil administration there is obvious possibility of difference of view on such matters as allocation of accommodation, its disposition, and, it may be, its use, but even within narrower ambits there is often considerable difference of outlook. The sister of ward A grudges to the sister of ward B the shape of her ward, the number of its windows, the number of its pots, the number of its beds, their coverings and a whole host of other things of similar nature. Theatre Sister grudges many things alike to Sister A and Sister B. These things are inevitable and part of the accepted scheme of things. But conflicting interest does not stop at that; there is a growing tendency for authority to bestow upon us many frills, some doubtless desirable enough but all competing for a place in the sun. It is a curious fact that these adventitious bodies seem to share a reluctance to share anything, certainly to share accommodation, however suitable.

It is a characteristic of human nature to want a home of its very own, but in hospital where accommodation is limited it can be a very trying characteristic. The appetites of contestants are whetted by the knowledge that some fraction of hospital beds is held in reserve for casualty reception; a room temporarily empty is a provocation and a stimulus to cupidity. We have in our hospital one small ward that used to accommodate six beds before it became obvious that it would have to be sacrificed to official camp followers. It so happened that at that time there were four or five candidates for accommodation, an irascible colonel, a welfare officer, and two or three clergymen of varying hues. The colonel was of Irish extraction and in his capacity as president of a visiting medical board had been flitted from room to room to suit the exigencies of hospital traffic. He came to us for a half-day once a week, but he wanted a home of his own and would not be happy until he got it. Further, he wanted a home with his own name inscribed on its door in letters of gold. Like

others of the contestants he shared Swift's aversion to having Heaven crammed. The clergymen held services in the recreation-room on Sundays, but they wanted some more intimate retreat for solitude and for Holy Communion, the latter at 7.30 A.M. twice weekly. The welfare officer, too, wanted a room for her very own. All the candidates thought they were indispensable to the work of the hospital, whereas it had, in fact, functioned perfectly smoothly before their arrival. There is, of course, nothing new in this attitude of mind, nor is it confined to hospital experience, but it becomes particularly tiresome when it has to be humoured at the sacrifice of beds. We thought that in the interests of social study we might bring our contestants together under a common roof. We naïvely explained to the welfare officer, who wished to teach handicrafts, French, German and English literature to our sick soldiers, that she could have the use of this excellent room, except on Thursday mornings when it would be required for medical boarding, and when, doubtless, she could arrange to busy herself in other work about the hospital. To the colonel we said that the room was at his disposal on Thursday mornings; to the clergymen that they could have the room at 7.30 on mornings to be mutually arranged (greatly daring) and that if they particularly wanted to use it at any other time it would doubtless be possible to arrange accordingly, or to provide alternative accommodation. But our experiment was not a conspicuous success, for the experimental animals did not live happily together. True, the colonel seemed to be appeased so far as he was ever likely to be appeased by anything, but the clergymen seemed to think they had a grievance and that they should communicate with the chaplain-general, or the presbytery, or the bishop, or all three. The welfare officer, who seemed to have emerged with the lion's share of the spoils, grumbled most of all.

The function of a welfare officer in a hospital doing acute work and with rapid turnover of Service patients has not yet been precisely defined. Quite 95% of the patients in an acute hospital do not want to be educated in the formal sense of the term, nor are they in any fit state for such education, a point sometimes overlooked. Entertainment in plenty they do appreciate, and the lighter the entertainment the better. It is true that there are a few more seriously minded among our patients, but it only exceptionally happens that the stay of such a patient in hospital is long enough to make practicable any serious embarkation on the desired path of knowledge. There is much loose talk about the psychology of welfare work in an acute hospital, and unfortunately the thing has been invested with a certain odour of political sanctity. There is certainly scope for sympathetic administration in all hospitals and for sustained welfare of an educative nature in hospitals dealing with more chronic patients; above all, scope for effort to secure that patients boarded out of the Army are securely settled into civilian life.

* * *

When I left my ship, and over the stern of the launch saw her fading grey and lovely into the mist, I felt like a boy leaving home. Later on, however, it was pleasant to be an individual again and enjoy that quiet rumination which one does not come by in the confused noise of four wirelesses and the happy turmoil of corporate life. And so it was I came to Edinburgh and found some gardens there, and spent an hour or so walking up and down after the manner of caged beasts or men on ships. Abeam over towards the Castle, a robin sang his clear-cut notes, and on the other side in the middle of my pacing, was a war memorial on which was inscribed: "If it is life that waits we live for ever unconquered, if death we shall die at last strong in our pride and free." I gloated over those words, mouthing them as oysters. Those monosyllables, how hard and clean they hit, like straight lefts or neat whisky. For how many millennia did man speak almost in monosyllables alone? Is it that thereby they have worn a smooth word track to consciousness, longer words having to be sent another way round for identification? Nearly all the early words must have been onomatopes, and most of these would be monosyllables, but by no means all. I remember once rowing down the Nepean in Australia and my rowlocks made a weird skereech-clomp-clump, which was faithfully imitated by a lyre bird on the bank. Probably the first double-barrelled proper name was Wonk-Wunkle, so called from the noise made by the gases from that lady's or gentleman's intestine. Yes, and do you remember years ago that Irish major we had on board whom we all thought was slightly mad? He'd spent years on the Burmese frontier and had a theory that all languages were basically the same in sound, and if your ear was attuned you could stroll into any country and understand the lingo straight away. Later we heard he had tried it out among the Solomon Islanders and they ate him. Gosh, it's good to be alone again; thought and memory and imagination don't seem to act in concert in a crowd. Is that why, as McDougall pointed out, the judgment of a group of men is often unworthy of any one of them individually? Going south in the train I felt suddenly lonely and shipsick. They'd be playing poker now, I could see them sitting round a table, the lamp swinging to the sea: Red Ike who always pointed like a dog when he was bluffing; Tich whom I never found out, he looked like a cherub whether he held a pair of twos or a straight flush; Winkle who was reckless or dull according to the tone of the last letter from his girl; McSporran whose voice rumbled with emotion when holding a full house or better—"I'll rrrraise you." Shipmates of mine!

* * *

There are few red-letter days of barberism which have stamped themselves on my memory, but one is outstanding. During the last war I had been stationed somewhere among the ruined villages of the Marne; but the day came at last when I had certain tasks to do in Paris, and a few days of semi-leave. As soon as my train got in, I walked along the Rue de Rivoli, chose the most luxurious-looking coiffeur that I could find, relaxed into a chair and made myself over to an expert, whose manipulations and conversation proclaimed him an artist rather than a mere technician. I wallowed unashamedly in this sudden and complete break, if only for a fleeting hour, from the severity of trying to keep warm at nights in a thin wooden hut, when the temperature outside was low enough to freeze the camp larder's milk and eggs quite solid; of trudging through the unspeakable mud, or bumping precariously in a ramshackle car over roads that were little else but pot-holes; of meeting at every turn the human misery of war; and of a good deal of sheer boredom. Here at least was a bit of civilisation, and emerging at length with face and head tidy, bescented and shining, I must confess that I liked it.

Nowadays I am usually two weeks late at least—perhaps it is more—in having my hair cut. "The world is so full of a number of things, that I'm sure there's no time for hair shearings," as R. L. S. said in effect. This time mine had got so shaggy down the neck that, in a wild moment while shaving, I ran my safety razor down such posterior aspect of the neck as came within my vision—alas! not very symmetrically. "Have I caught you using a safety razor on the back of your neck, Sir?" said my barber sternly. I confessed to the sin, and he forgave me. "Talking about hair on necks," he went on, "there's many a customer come in recently and asked me not to take much off the top, just to trim the neck. You see, they've had 'flu or colds, and they think they will catch fresh cold if they're not careful. You know, Sir, they don't realise that if you take it off the neck, you are really exposing a most vulnerable part of the body. Far better take it off the top." Has he hit on an important medical truth?

THE Incorporated Orthopædic Hospital of Ireland is to be transferred from Upper Merrion Street, Dublin, to a more suitable site in Clontarf where there is ample room for expansion. This will be the third move that the hospital has made since a young surgeon, Robert Lafayette Swan, in 1876, on his own initiative opened a small house in Usher's Island for the reception and care of crippled children. The demand on its services grew and in 1883 the hospital was moved to Great Brunswick Street, where it had accommodation for 48 patients. In 1902 it moved again to Upper Merrion Street where it has 77 beds. The hospital is devoted solely to the treatment of deformities, and since it was founded has treated over 50,000 crippled children. Last year there were over 5000 attendances at the hospital's gymnasium where preventive and hygienic treatment is given. The outpatient department will carry on in premises in the city.

Letters to the Editor

THE LATE SIR FREDERICK BANTING

SIR,—Details of the death of Sir Frederick Banting are only now beginning to reach England from Canada; from these it is apparent that he died as generously as he lived. He was not immediately killed by the impact of the crashing plane but lived for some hours; his first act was to attend to the injuries of the pilot. Characteristically he refused to have any attention paid to his own wounds, and insisted on dressing those of Pilot Mackie, who then set out to look for help. Banting then seems to have dragged himself from the plane and to have lain down on some pine boughs which the airplane had torn from the trees skirting the frozen lake on which the attempt to land had been made. There, with his overcoat pulled over him against the bitter cold, the pilot found him later—dead.

Banting's death was a blow to the medical world. It is little short of a tragedy for medical research in Canada. More than any other man he taught Canadians that they could play a worthy part in the world-wide endeavour to advance medical knowledge, that they did not need to go abroad for a research training or to do original work, and that workers there could evolve their own ideas, successfully do their own experiments and make as valuable contributions as others. For twenty years Banting encouraged young graduates to undertake the study of fundamental problems in their own schools and universities, organising the means for them to do so. Because of the unique position he occupied in the public mind he was able to create the opportunity for investigation where it had not existed before. He convinced medical and government authorities that research had a permanent place in the institutions of the country, and leaders of industry that money spent on research was a sound investment. By securing endowments he hoped to make it possible to keep the most gifted talent at home. "Too many of our best men go to the States and we lose them," was one of his complaints. At the same time, he was a firm believer in a broadened outlook. He encouraged men to come to England, to go to the United States, to Germany—"to get another slant on things." And he made it possible for several to come, who otherwise would not have so benefited; to his beneficence I owe myself two years of valuable experience in this country and Germany. His feelings for the Imperial ties were strong. He particularly liked his students to come to England. He welcomed British researchers, and hoped that Canadians would show themselves worthy of the welcome accorded them in the old country. His gratification with any recognition they might gain was great.

For seven years it was my privilege to be associated with Banting and to see his department of medical research grow up from its small beginnings in three indifferent rooms in the old pathology building of the University of Toronto to the present highly efficient organisation in the Banting Institute. During this time I saw much of his own research effort—of the care with which he planned an experiment, of the consummate skill with which his manipulations were made, of the critical attitude towards his results. A more kindly and sympathetic director could not be desired. The young, and often timid, worker could always go to him with the confident expectation of having his ideas listened to patiently and with interest, of having flaws in his reasoning pointed out, and of obtaining wise and unbiased advice as to whether a project was worth embarking upon. Banting showed a fine critical capacity in assessing research possibilities. He realised that there could be a bad question as well as a bad answer, and that nature can only be expected to give a clear reply to a properly formulated query.

His collaboration in large-scale investigations, such as those on silicosis and war medicine, showed his powers of successful organisation, of holding a body of workers together and of maintaining a comprehensive hold of a diversity of ideas contributing to a common goal. A colleague, who was associated with him at the end, writes: "He was as energetic and active as before, but more tolerant, more sympathetic than ever. . . . I think he felt that at last his group was making a worth-while effort to solve problems connected with the war and that real progress was being made. . . . He also gloried in his stamina—he could stand higher 'altitudes' in the pressure chamber than youngsters in the R.C.A.F., and pilots who took him up for power dives blacked out before he did. Tail spins, side slips, sharp banks didn't bother him at all. He loved them!"

Many people have commented on Banting's modesty, on his almost boyish enthusiasm. He exhibited a certain shyness in introductions, but had an ability to make quick and lasting friendships. He never lost his interest in, nor his love for, the homely background of his youth. His pleasure was as spontaneous in the company and conversation of the lowliest of his helpers as it was among the great whom he met. This man could not help but win the respect and devotion of his associates and friends.

Hillingdon, Msx. E. J. KING.

TUBERCULOSIS AND WAR

SIR,—In a leader (April 12) you refer to Prof. Collis's article in *Tubercle* describing the effect of food shortage in the last war on the mortality from tuberculosis in Europe. Surely, before the present war can produce any serious effects, a further consideration of food rationing as it affects the tuberculous subject should be made. The effect of any lowering of nutritional standards on the patient with open disease is so obviously going to be adverse that this point hardly needs stressing. Nearly as important is the likely effect of food rationing upon the patient with arrested or quiescent disease possibly just holding his own, under normal conditions, against a breakdown of resistance. Under the present, or any future more stringent, rationing system the balance may just be tilted against him, thus making him once more a charge on the community. Incidentally, as regards the rationing position, a comparison between the present lot of the tuberculous subject and that of the diabetic is irresistible.

A second point arises from your observations on the rise, again during the last war, of the mortality-rate amongst female munition workers. We should now consider the institution of a far-reaching scheme for the mass miniature radiography of workers, of both sexes, in this and other industrial fields. The difficulties, admittedly great, of starting such a scheme should not be allowed to blind us to its obvious and manifold advantages. In this connexion the Navy has set us a shining example.

Kelling Sanatorium, Holt. B. G. RIGDEN.

REPEAL OF THE MEDICINE STAMP DUTIES

SIR,—Your leading article of April 19 raises issues of the first importance to the medical profession. It is not, I think, sufficiently realised that the whole position of the sale direct to the public of patent medicines constitutes a form of unqualified practice, especially mischievous as it exploits more particularly the very poor and the ignorant. I believe the profession will cordially support your dictum that "this is no time for helping the sale of secret remedies, or indeed for encouraging the sale of any medicines beyond the needs of the community." The "reasonable solution" to which you refer as having been found between interested parties has not been disclosed, but will of course come before Parliament for consideration and debate.

It may perhaps be pertinent to look into the influence on legislation exercised by these respective interests which are named in your article, and how far these interests are compatible with the interests of the general public and with public policy. We have on one hand the Proprietary Association of Great Britain, that is to say the manufacturers of patent medicines, and on the other a number of bodies representing the pharmaceutical profession. The Chancellor in introducing the Budget promised (Hansard, April 7, col. 1315) that before the repeal of the medicine stamp duties would actually take effect the Ministry of Health would introduce legislation to restore something of the protection afforded to the public by the present stamp duties, but no details of this promised legislation are offered. It is obvious that no Minister of Health can be oblivious to the "dangers arising from the indiscriminate sale of medicines," to use your own admirable forecast. It is

therefore surely a little odd that there has been no representation of the medical profession in the preparation of the "reasonable solution," the securing of which is the reason given by the Chancellor for the repeal of the present duties.

It is one of the curious accompaniments, or sequels, of a state of war, that the formation of powerful combines, or trusts, is encouraged. This development has been particularly conspicuous in the food trades, and I submit should be resisted in the case of drugs. In an excellent little book entitled "Our Food Problems," recently published in the Penguin series, some of the legacies of the last war are instanced. A select committee which considered the position of medicine stamp duties in 1936 estimated that the turnover of the patent medicine manufacturers could, at a modest valuation, be put at £20,000,000 a year. A body in such a commanding financial position has an enormous advantage in negotiation against the modestly provided professional bodies with which they are to come to an agreement. The Proprietary Association of Great Britain can exercise a wholly disproportionate influence on the press, and even on Parliament.

That the immediate result of this repeal will be a mischievous increase in self-medication cannot be gainsaid. It may be prophesied with confidence that patent medicines will be obtainable in 6*d*. and 3*d*. packets from automatic machines, chain-stores and grocers' shops. This is surely an unfortunate occasion to run risks of this nature, and I would urge the medical profession to sit up and take notice of the position to which your leader draws attention.

House of Commons. E. GRAHAM LITTLE.

ANY SUBSTITUTE FOR LIQUID PARAFFIN?

SIR,—Dr. Izod Bennett has asked a simple question, and I would like to answer his inquiry as to a substitute for liquid paraffin, because I think that its present shortage may prove to be as salutary as is the prospective disuse of white flour.

The laxative that I most frequently prescribe is powdered rhubarb. It is conveniently given in the form of Tabloid Rhubarb gr. 3 (B.W. & Co.). The usual dose is 1, 1½ or 2 tabloids with water at bed-time. It is especially indicated in dyschezia, whether sigmoidal or rectal, congenital or acquired. It is conveniently reinforced, when inadequate alone, with Kellogg's bran or Bemax taken in the morning. Needless to say, it is important to advise the patient about the physiology of bowel function, especially in regard to there being good time and opportunity in early morning activities for the bowels to act. There are many persons whose bowels do not act in the morning (unless they are purged) until three-quarters of an hour after beginning breakfast, or are prevented from acting by a hurried rush in dressing and eating breakfast. In fact some people are so rushed that they hardly take a breakfast. It is to be remembered too that some people are habitually tired, because they go to bed too late, and that the first and only symptom of fatigue may be constipation. I believe that a suboptimal intake of vitamin B_1 may be responsible for constipation.

Rhubarb is a good laxative also for the reason that those intolerant of it know it at once by the intestinal discomfort or pain it gives them. Many other laxatives taken daily for years on end are or become poisonous to the patient, but their symptoms of intolerance are not obvious and are not therefore generally recognised as being due to the laxative. Those who get pain after taking rhubarb are to be suspected of having an irritable colon. A preparation of belladonna may then prove to be the best laxative.

Alternatively, for many years I have prescribed a pill, long used in medical practice, containing extract of aloes gr. ½, extract of nux vomica and belladonna of each gr. ¼. To this may be added extract of hyoscyamus gr. ½ in some cases. The dose of aloes is varied according to need. It is taken at bed-time. It may have more effect if taken after the evening meal, and perhaps even more if taken immediately before the evening meal.

The objective is the evacuation of a soft formed stool with a sense of completion. Habitual loose stools are by all means to be avoided. Needless to say, the treatment of constipation by drugs is the simplest means. In some people, particularly those with an inherited sigmoidal dyschezia, there is no alternative treatment. But it is to be remembered that there is a so-called psychological approach to the treatment of chronic constipation, and that it is inexcusable to prescribe a habitual laxative without first advising the patient as to the physiology of bowel function and the necessity of good habits. This advice may make any form of laxative unnecessary.

Lastly, some people who think they are constipated are not. They have made a wrong diagnosis. When there is no more liquid paraffin, these people will not require a substitute.

Mansfield Street, W.1. GEOFFREY EVANS.

SIR,—Dr. Izod Bennett is asking your readers to recommend a substitute for liquid paraffin during its present scarcity "for those who constantly require something." But do we want a substitute if by that is meant a substance with the same properties? Liquid paraffin has been frequently shown to prevent the absorption of carotene (provitamin A) in animals, and among other clinical workers Curtis and Ballmer (*J. Amer. med. Ass.* 1939, **113**, 1785) proved that in man the usual doses of liquid paraffin or paraffin emulsions prevent about half the carotene of the food being absorbed. Clinical work on vitamin D is difficult, but again liquid paraffin in animals is known to prevent the absorption of vitamin D, and even according to Smith and Spector (*J. Nutrit.* 1940, **20**, 197) to decrease the antirachittic effect of sunlight. It also seems likely that liquid paraffin decreases the absorption of vitamin E. Lack of vitamin A, besides causing such conditions as night blindness, senile vaginitis and an increased tendency towards respiratory infections, may also, according to the work of Herfort (*Acta med. scand.* 1938, **96**, 425) and Foldes and Vajda (*Brit. med. J.* 1941, **1**, 318), be responsible for much rather vague dyspepsia; while Meulengracht and Meyer (*Ugeskr. Laeg.* 1936, **98**, 961) believe that the osteoporosis of the old, which leads so often to fatal fractures of the femur, is only mild osteomalacia due to deprivation of vitamin D. Vitamin D is also, of course, necessary for the economical use by the body of the calcium which is so deficient in our diets that it has to be added to our bread. It seems, therefore, that a scarcity of liquid paraffin and its emulsions has advantages; among them the relief of those vague digestive disturbances for which it is often given, and an increase in general good health as a result of removing one contributory cause to the widespread minor deficiencies of vitamins A, D and E which will further increase with war diets. The B complex, most cheaply given as wheat germ or yeast, often relieves constipation, and it is particularly indicated in patients who for years have taken liquid paraffin, since they tend as a class to take a diet deficient in the B complex.

Wimpole Street, W.1. FRANKLIN BICKNELL.

INSULIN KINASE

SIR,—Nine years ago I published[1] certain investigations which had led me to put forward the hypothesis that insulin as secreted by the pancreas is an inactive substance which requires activating by an insulin kinase before it can exert its physiological effects. This conception I further developed in a subsequent article.[2] The basis of this hypothesis was a series of experimental results on animals and human beings which demonstrated that the rate at which insulin came into action was not constant but varied under different conditions. There appeared to be two possible simple explanations of this variation in insulin efficiency. First, there might be interference with insulin action due to the presence of an inhibiting substance; second, the development of insulin action might be retarded by the relative lack of a complementary substance such as an activator. After discussing both possibilities, I concluded that the evidence then available favoured the second of these two explanations. Since then, the work of Houssay and his colleagues has received universal recognition. They have shown that extracts of the anterior lobe of the pituitary gland contain a substance which inhibits insulin action, and it is now clear that many of the results which I interpreted to indicate the lack of an activator of insulin

1. *Lancet*, 1932, **2**, 935. 2. *Clin. Sci.* 1933, **1**, 1.

are more easily explicable on the grounds of the presence of a relative excess of an inhibitor substance, or substances, with properties similar to those of anterior pituitary extracts. I am, however, not satisfied that all the variations in insulin action can be explained by the presence in varying amounts of such an inhibitor of insulin. For example, the variations in insulin action resulting from dietary change still appear to occur to a slight extent after hypophysectomy[3]; in insulin-insensitive cases of diabetes mellitus the presence of an inhibitor of insulin has only been demonstrated in those cases associated with hyperpituitarism, and attempts to demonstrate a similar inhibitor of insulin in cases of insulin-insensitive diabetes mellitus unassociated with hyperpituitarism have so far failed[4]; Krebs and Eggleston[5] have shown in vitro that insulin is susceptible of activation.

The present position therefore is this. The majority of the results which I originally interpreted as suggesting the relative lack of an insulin-kinase can in the light of present knowledge be more easily interpreted as being due to the presence of varying degrees of inhibition of insulin action. This conclusion, however, should not be extended to mean either that the possibility of insulin requiring activation has been excluded, or that the known physiological or pathological variations in insulin sensitivity are now completely explained on the basis of varying degrees of inhibition of insulin action by substances similar to, or identical with, the "anti-insulin factor" of the anterior pituitary gland.

H. P. HIMSWORTH.

University College Hospital medical school.

STERILISING VASELINE DRESSINGS

SIR,—In its notes on the treatment of burns (*Lancet*, March 29, p. 425) the Ministry of Health tell us that we can prepare sterilised Vaseline dressings by melting the vaseline in a tin, adding the dressings, and keeping the tin in a dish of boiling water for half an hour. This does not seem to conform to accepted teaching for the sterilisation of either vaseline or dressings. In the Extra Pharmacopœia (21st ed., vol. II, p. 913) one reads: "Oils, fats and waxes (including liquid, soft and hard paraffins). These can only be sterilised by heating to 150° for 1 hour in a hot air bath" (all temperatures are Centigrade in this publication). The temperature in the middle of our tin is likely to be appreciably below 100° C.; will the dressings be effectively sterilised?

Cuminestown, Aberdeenshire. A. T. FORBES.

THE CASE FOR MASS RADIOGRAPHY

SIR,—In a leading article on page 512 of your last issue reference was made to the examination of Royal naval personnel "at a cost of less than 1*d.* each." This statement reminds me of one frequently made by amateur photographers, who possess expensive miniature cameras, when the high cost of the camera is overlooked as well as the degree of technical ability and skill required to obtain satisfactory results. It is now well known that special and expensive apparatus is required for successful miniature screen radiography, as well as a fairly large and highly trained personnel, whose salaries (or the equivalent) have to be taken into account. A special report on the subject, recently adopted by the Joint Tuberculosis Council, is now in the press. Copies may be obtained from the hon. secretary, Dr. J. B. McDougall, Preston Hall, Aylesford, Kent.

Tuberculosis Dispensary, Leigh, Lancs. G. JESSEL.

INDUCTION OF LABOUR WITH UROSELECTAN B

SIR,—In your annotation of April 5 a faithful synopsis of Playfair's article includes the words, "Playfair has now used the drug as a deliberate method of inducing labour," which infers that the method has not been used before. Uroselectan B has in fact been used as a means of inducing labour since 1933, and so far as I know I was the first person to employ this procedure and to publish a series of cases, a fact not mentioned by Playfair although he quotes my article (*J. Obstet. Gynæc.* 1935, **43**, 1096).

Sunderland. F. J. BURKE.

3. Himsworth, H. P. and Scott, D. B. M. *J. Physiol.* 1938, **91**, 447.
4. Himsworth and Kerr, R. B. *Clin. Sci.* 1940, **4**, 287.
5. Krebs, H. A. and Eggleston, L. V. *Biochem. J.* 1938, **32**, 913.

Public Health

From the Annual Reports

FOUR TOWNS

COMPARING four typical English towns of small size—Ipswich, area 8629 acres, population 86,000; Dewsbury, area 6729 acres, population 53,000; Accrington, area 4418 acres, population 40,000; and Kettering, area 4546 acres, population 35,000—we meet with curious differences in the mortalities, the explanation of which is far from obvious. The birth-rates of the towns in the order given above were: 14·6, 14·4, 10·1, 13·1. The death-rates were: 11·5, 13·3, 14·7, 10·8. These show Accrington to differ from the other three in having a falling population and with this go many factors which disturb the death table. The infantile mortality, which is not influenced by the age-sex distribution of the population, but is affected by some of the factors which determine shifts of population, was not far from level—49, 50, 45, 44. When we come to certified causes of death we meet with some surprises. If we standardise the recorded numbers from the four towns to what they would be if all had populations equal in number to that of Ipswich, we find:—

Town	Cancer	Tuberculosis	Respiratory diseases	Cardiovascular diseases	Digestive diseases	Diabetes
Ipswich ..	177	61	84	455	35	23
Dewsbury ..	141	44	58	458	42	14
Accrington	174	41	75	546	56	15
Kettering ..	145	61	86	326	22	25

The cancer deaths are nearly equal in Ipswich and Accrington, and in Dewsbury and Kettering are also nearly equal but about a fifth less than in the first two. The probable explanation is population age: Ipswich old because it is partly residential; Accrington old because of emigration of young people; Dewsbury and Kettering average working towns. Tuberculosis in Ipswich and Kettering are equal, and in Dewsbury and Accrington are equal but only half that in the first pair. A probable explanation in Accrington is emigration. In Dewsbury, low tuberculosis is associated with low respiratory mortality. In Accrington this is not so definite though it is apparent. Cardiovascular disease is equal in Ipswich and Dewsbury, high in Accrington and low in Kettering, in which latter town digestive deaths are also low, though diabetes is high. Vital statistics reflect the nature of populations more clearly than their health, and this invalidates many medical statistics relating to the results of treatment.

COLCHESTER

From Dr. W. F. Corfield's much abridged reports we learn that in this borough in 1939 the infantile mortality was 28·5, a low record for the town. There were 769 live births and 32 stillbirths (14 males and 18 females). The only death from notifiable diseases apart from tuberculosis was from encephalitis lethargica. There were 6 deaths from diabetes, 84 from cancer and 28 from tuberculosis; 7 deaths can with certainty be attributed to syphilis, apart from those included in the heart and circulatory diseases other than aneurysm. An unusual incident was the condemnation of a consignment of 489 imported sheep and lamb carcasses. We imagine this must have been due to some breakdown in transport or storage.

In Dr. Corfield's school report there is a table of the incidence of head-lousiness in the schools of the borough showing the increase or decrease on the previous year in each department of every school. The variation is from + 49 to − 31. The percentage of children found verminous varied from 11·8 to 0. Out of 30 departments 7 had a louse-index of less than 1%. The general incidence was 2·9%. At routine inspections 95·8% of the heads were clean and 4·2% verminous.

NORTHAMPTONSHIRE

In the last war tuberculosis began to rise as soon as hostilities started, but the fear that the process might be repeated in this war is somewhat allayed by the

records of 1939. Dr. Charles Milliken Smith, county medical officer, gives the tuberculosis mortality of Northamptonshire as 0·49, which is a low record. The comparable general death-rate of the county was 10·5; infant mortality 40·4 and maternal mortality 1·1. Infectious diseases were low in prevalence and scarlet fever, diphtheria, measles and whooping-cough caused but 5 deaths in the population of 222,000 which, after the outbreak of war, was increased by many refugees. These are statistics of an unusually healthy year. A point of interest is the fall in numbers of new cases of venereal disease attending the clinics, from 197 in 1937 and 174 in 1938 to 146 in 1939. We are not justified in assuming that this fall is an indication of reduced incidence, for since the introduction of sulphonamide compounds in the treatment of gonorrhœa practitioners treat cases of this disease privately instead of sending them to clinics, but new cases of syphilis appear not to be increasing.

ECCLES

The most interesting detail in the 1939 report of Dr. J. E. Spence is a case of psittacosis which was confirmed. This disease has not so far been more than a curiosity and a menace, and rare as it has always been, had been nearly exterminated in Western Europe and North America. In Australia, where psittacosis is endemic in the wild birds, the human disease is no more frequent than it is in Europe. Its chief interest is that it can cause outbreaks in man, and an outbreak among the keepers of the parrot-house at the London Zoological Gardens a few years ago suggested that it might become a truly human epidemic disease.

BIRKENHEAD

Dr. D. Morley Mathieson reports that in 1939 of 2405 live births 1207 were females; of 118 stillbirths 56 were females, and of 1804 deaths 1197 were females. These sex-distributions are unusual. The sex-distribution of deaths is now beginning to reflect the loss of a million males in the last war, but the increase of female over male births is not to be explained. In 7205 school-children medically inspected no case of organic heart disease was discovered.

EAST KENT

East Kent (No. 1) United District is made up of the urban districts of Herne Bay and Broadstairs and the rural district of Bridge-Blean and has a population of 45,000. Dr. Clement Dunscombe reports that in 1939 there was only one death from a notifiable disease (apart from tuberculosis and pneumonia) which was from poliomyelitis; 5 cases of this disease were notified, including one of polio-encephalitis. A few years ago poliomyelitis was epidemic in the district and an incidence of over 1 per 10,000 population in non-epidemic times is high.

From the School Reports

WALTHAMSTOW

Dr. A. T. W. Powell in his report to the education committee gives the statistics of cases of throat, ear and nose conditions treated at the clinic by Dr. Francis Clarke. Of 104 children with acute otitis media treated, 90 were cured, 22 left or allowed the treatment to lapse, and 2 remained under treatment at the end of the year. Operation for tonsils and adenoids had been performed in 17 of the children before they attended the clinic and in 5 others the operation was done as part of the treatment. Apparently no case required mastoidectomy. Of 60 cases of chronic otitis media, 39 were cured, 12 allowed the treatment to lapse and 8 are still under treatment. The remaining case appears to have been "lost." Mastoidectomy had been performed on 4 of the children before they came to the clinic but was not required by any others. We are not told the criteria which decide the differentiation of acute from chronic otorrhœa. Of 128 throat and nose cases treated, 50 were cured and 60 either left or allowed the treatment to lapse. The tendency is towards fewer tonsillectomies and radical mastoid operations and to greater use of such conservative measures as suction, ionisation and diastolisation.

CHELMSFORD

Dr. J. Mervyn Thomas tells us that in 1940 12·2% of the children in elementary schools were receiving free milk and 55% were purchasing it. Chelmsford, a reception area, set up two sick-bays for evacuated children, but was able to dispense with them later. This suggests that the troubles with evacuees were often temporary, due to the upset of the times. Of children examined for nutrition, only 3·1% were placed in category C (slightly subnormal) and one in D (bad). From the reports for 1940 available, it appears that the nutrition of school-children in 1940 was better than it was in 1939 and no evidence of deficiency was detected.

Health of Ceylon

Dr. S. T. Gunasekara's report for 1939 is much shorter than usual and lacks some chapters which we expected. The two chief events in public health in Ceylon in 1939 were a severe epidemic of malaria and a reorganisation of the public-health service. Malaria is always the most serious problem there, for in a good year about a third of the population seeks treatment for it, and 1939 was a bad year. Of a population of almost 6 million over 3 million were treated for malaria at the dispensaries, and over a hundred thousand in hospitals. Of the cases sent to hospital 2700 died, but there is no record of the total number of deaths due to the disease. There was no plague in the island, only 1 imported case of smallpox, and 7 of cholera, 5 of which were fatal. There were 4300 cases of dysentery with 300 deaths; 3000 cases of enteric with 500 deaths; and 2700 cases of pulmonary tuberculosis with 750 deaths. The birth-rate was 36, the death-rate 21·8, and infantile-mortality rate 166. Ceylon has the most equable climate in the world—in some parts the variation of temperature between midnight in midwinter and midday in midsummer is less than that in a summer afternoon in England—yet the island suffers severely from the diseases which we attribute to our changeable climate. On the other hand, it is almost free from cancer (other than betel-chewing cancer) which is the one disease in which climate is supposed to have no influence.

Infectious Disease in England and Wales

WEEK ENDED APRIL 12

Notifications.—The following cases of infectious disease were notified during the week: smallpox, 0; scarlet fever, 1023; whooping-cough, 3592; diphtheria, 883; enteric fever, 26; measles (excluding rubella), 13,030; pneumonia (primary or influenzal), 944; puerperal pyrexia, 124; cerebrospinal fever, 282; poliomyelitis, 4; polio-encephalitis, 1; encephalitis lethargica, 3; dysentery, 144; ophthalmia neonatorum, 68. No case of cholera, plague or typhus fever was notified during the week.

Deaths.—In 126 great towns there was no death from smallpox or enteric fever, 2 (0) from scarlet fever, 39 (2) from whooping-cough, 19 (0) from measles, 31 (0) from diphtheria, 30 (1) from diarrhœa and enteritis under 2 years, and 53 (2) from influenza. The figures in parentheses are those for London itself.

There were 6 deaths from diphtheria at Liverpool and 5 at Birmingham. Birmingham reported 6 fatal cases of whooping-cough, Liverpool 5, and in the same week there were 14 in Glasgow.

The number of stillbirths notified during the week was 211 (corresponding to a rate of 47 per thousand total births), including 20 in London.

On May 20, at 5.15 P.M., at the Royal Institution, 21, Albemarle Street, London, W.1, Sir Joseph Barcroft, F.R.S., will describe the development of function in the mammalian organism. On the following Tuesday at the same time Mr. C. F. A. Pantin, F.R.S., will speak on the origin of life.

A meeting of the Medical Society for the Study of Venereal Diseases will be held at 11, Chandos Street, London, W.1, on Tuesday, April 29, at 2.30 P.M., when Dr. Morna Rawlins will open a discussion on how to get the infected woman under treatment. On May 27, Dr. H. M. Hanschell will speak on venereal buboes, and on June 24, Dr. I. N. Orpwood Price on laboratory facilities in the diagnosis of venereal diseases.

MORE WORK ON DIPHTHERIA TOXIN

AT a meeting of the section of pathology of the Royal Academy of Medicine in Ireland on Feb. 14, with Dr. D. M. Mitchell, the president, in the chair, Dr. R. A. Q. O'Meara and Dr. P. A. McNally read a paper on some further experiments they have made on hypertonic diphtheria. They have shown that by combining sub-lethal doses of diphtheria toxin derived from the Park-Williams No. 8 strain with relatively insignificant amounts of other bacterial toxins, effects can be obtained similar to those previously produced by combination of the classical diphtheria toxin with extracts of gravis strains. Guineapigs inoculated subcutaneously with such mixtures develop large swellings with increased local necrosis and later paralysis. In place of bacterial toxins, or filtrates, testicular extract can be employed and gives similar effects. As has previously been noticed with substance B from gravis strains there is no influence on the M.L.D. of the toxin for the guineapig. Experiments have shown that dissociation of diphtheria toxin from its combination with antitoxin can be effected by means of small quantities of toxin derived from organisms other than the diphtheria bacillus.

In the discussion which followed Dr. W. A. Gillespie asked whether the diffusing factor which exists in the testis is antigenic, and if so, whether this throws any light on further methods of treating hypertoxic diphtheria. He also asked how the B substance in the toxin can lead to paralysis.—Prof. W. D. O'Kelly said that in his experience the giving of toxin to guineapigs does not produce paralysis. He asked Dr. O'Meara if he had tried giving saline extracts of Park-Williams No. 8. He himself had found that they were less active in the production of swellings than the gravis strains.—Prof. Hans Sachs wondered whether the toxins have altered in the years since he worked on the titration of diphtheria serum in the Ehrlich Institute. He asked whether the anti-B substance in the antitoxin is specific, and whether the B factor is really an antigen. Experiments have shown that it is possible to increase the action of toxins by certain substances, for example, tissue extracts. He referred to work done in America which demonstrated that the action of tetanus toxin can be increased by the addition of tissue suspension.—Mr. J. C. Flood asked whether the B factor was common to all toxins, and whether Dr. O'Meara had identified it with mucinase, which is apparently a tissue substance.—Prof. John McGrath referred to the differences between gravis and non-gravis strains of diphtheria, and asked if the organisms causing the serious type of paralysis propagate more rapidly than the other organisms. He wondered whether Dr. O'Meara has found clinically that all strains of diphtheria isolated from the hypertoxic cases will produce the B factor, and if not, how it is possible to explain the clinical difference between the different types of infection.

In reply to these and other questions, Dr. O'Meara said that diphtheria toxin is certainly composed of two parts. Park-Williams No. 8 toxin as usually prepared has a very high proportion of substance A relative to substance B. The use of saline extracts of gravis strains was merely a convenient method of obtaining a preparation with a high content of substance B relative to substance A. The diffusing substance in testicular extract is known to be antigenic. Substance B acts in conjunction with substance A in producing paralysis; the type of toxin producing paralysis is that which has a high proportion of substance B relative to substance A. There is much evidence to show that substance B is not only specific but also antigenic. Conclusive evidence should not be difficult to obtain. The term avidity as ordinarily employed is confined to antisera; he has succeeded in showing that it depends on the power of the antitoxin to neutralise substance B. In actual tests as carried out in the laboratory the apparent avidity of any given antitoxin must, of course, vary with the test toxin depending on the amount of substance B in the latter. Substance B is not histamine. It possesses the properties of a diffusion or spreading factor, but whether a mucinase or not has not been determined. It seems highly probable that all exotoxins possess a spreading factor. Among other points at present under investigation is the production of substance B by the gravis, intermedius and mitis strains.

Obituary

DAVID FORSYTH

M.D., D.SC. LOND., F.R.C.P.

TEACHERS are often remembered for being entertaining, manneristic, alarming, formal, confidential, or masters of good showmanship; there are dozens of ways of making facts memorable to a body of young and easily bored persons. David Forsyth was a teacher without devices; his grave and easy manner shook nobody, but left an orderly impression of his matter in the minds of his hearers. His ward rounds if they lacked dramatic moments also lacked disagreeable ones for either patients or students. He was born at Greenwich in 1877, and died on April 10 at Weymouth Street, London. A doctor's son, he was educated at Roan School and London University where he was Rogers prizeman. He became a student of Guy's Hospital, and qualified M.R.C.S., L.R.C.P. in 1900, M.B. in 1902 and M.D. in 1903, becoming M.R.C.P. in 1904. In 1908 he took his D.Sc., and was elected F.R.C.P. in 1910. His interests were wide; he became consulting physician to Charing Cross Hospital and to the Evelina Hospital for Children, and it is perhaps as a pædiatrician that he was best known outside the profession. His early and keen interest in the new schools of psychology growing up in the young century were evidence of his open and pliant mind; he never considered the last word had been said on any subject or that a new word must necessarily be a foolish one. But his attention to a subject for which few, at that time, had a good word to say amused some of his colleagues. This did not appear to cause him uneasiness; his numerous publications show his steady and growing enthusiasm for his subject, including as they do articles on psycho-analysis and its technique, on mental health in children and the psychological effect of illness upon them, the diagnosis of neurotic conditions in general practice, a study of psychology in relation to religion and—dry, pleasant reading—an account of the psychology of a middle-aged embezzler. He became senior physician to the psychological clinic of the Ministry of Pensions, and was a member of the British Psychological Society and the International Psycho-analytical Association. He married Kate, daughter of the late Frederick Neale, and leaves two sons.

Elliott & Fry

WILLIAM MITCHELL SMITH

M.D. ABERD.

Dr. Mitchell Smith, who died at his home at Stoke-on-Trent on March 20, had found his way to orthopædics through general practice and a lively interest in the welfare of children. He was educated at Aberdeen grammar school and university, where he qualified in 1900, and after a short time as an assistant in his native county he set up in practice for himself at Tean in Staffordshire. His interest in children's diseases drew him to London, whence after a period of study, he returned to Stoke-on-Trent to begin in a room in Wood Street the work that was to grow into the orthopædic hospital which now stands at Hartshill. With Sydney Malkin he guaranteed the money to convert an old stable into the Stoke-on-Trent Orthopædic Hospital (where at his own wish his ashes were scattered last week in the grounds). In 1930 an outpatient department was added to the hospital and a year later the open-air department. During the last war Mitchell Smith was able to do much for the maimed and cripples, and since the war he had done loose-cartilage operations for many of the local football clubs. He was also surgical tuberculosis officer to the city.

Dr. Mitchell Smith married Helen Wood Beech and they had two daughters and one son, a doctor, who is now serving with the Royal Air Force.

THOMAS BOSWALL BEACH

C.M.G., C.B.E., M.R.C.S.; COLONEL (RETD.) R.A.M.C.

Colonel T. B. Beach, who died at Reading on April 3, was the elder son of the Reverend Canon Beach, C.F. He was born at Brompton in 1866 and educated at Bloxham and King's College, London, where he was one of Lord Lister's dressers. After qualifying in 1889, he held house-appointments at his hospital before he elected to join the Army Medical Service. Competition for places was keen, but he passed out of Netley head of the list with the Herbert prize and Montefiore medal. He was one of the last batch to be commissioned "surgeon" in 1891. His first foreign service was in India, and he was thanked by the Government for his services in the outbreak of cholera at Lucknow in 1896. He served in the South African war, taking part in the advance on Kimberley, and it was at this time that he was promoted to his majority. During the last war he served in Egypt, becoming colonel in 1915. He was twice mentioned in dispatches, and on completing his appointment as A.D.M.S. in Alexandria he received the C.B.E. After his retirement in 1919 he lived with his mother and sister in Reading, where he gave much time to work for the Royal Berkshire Hospital. Though his health was indifferent he took a keen interest in local sporting events, and under trying conditions he remained a courageous and cheerful companion.

ANTHONY ALFRED FERRO

M.D. MALTA,

CAPTAIN, R.A.M.C.

Captain A. A. Ferro died of wounds on March 19. He was born in Malta in 1914 and educated there, qualifying M.D. from the University of Malta in 1937. He entered the R.A.M.C. in October and attended a course at the R.A.M. College that year. He was promoted captain in 1938.

GORDON COLEBROOK GILLISON

M.B. EDIN.

Gordon Colebrook Gillison who died at Frimley Sanatorium on April 6 put more into his thirty-two years of life than he ever attempted to take out of it. Meeting the handicap of diabetes as a medical student he accepted it, dealt with it and carried on. Following his family to China, where he had been born into a medical family—his father, mother and three brothers were all doctors—he started work at the Union Hospital, Hankow. Soon, however, he met another foe, the tubercle bacillus. Once again he took it as a medical opportunity: he would cure first himself, then others. To that end he returned to England and found at Frimley the double opportunity for study and for "cure." Emerging with an A.P. a year and a half later he plunged into sanatorium work at Peppard Common. Not for him however the easy and careful path; every patient that came his way had not only a body to be tended but a mind to interest, a spirit to encourage, relations to help. Every member of the staff was his friend and neighbour, their problems his, their days off or holidays pieces of a jigsaw puzzle to fit with his own commitments. His life was brief but enough for the sowing and the reaping of a rich harvest of affection. E. L. C.

FREDERICK JOHN McCANN

M.D. EDIN., M.R.C.P., F.R.C.S., F.R.C.O.G.

Dr. F. J. McCann who died on March 28 will be best remembered as a consultant who was profoundly interested in the treatment and prevention of common female ailments. After qualifying in 1888 in Edinburgh and demonstrating anatomy there he held a series of resident posts at hospitals for women and children and visited the principal continental clinics before being appointed surgeon to the Samaritan Free Hospital for Women at which he continued to work during the rest of his life. He was also consulting gynæcologist to a number of other hospitals in Greater London. At the Chenies Street polyclinic he developed an attractive style of clinical teaching and several of his books had a wide sale among practitioners, for they were based but little on precedent and authorities, setting out rather the details of procedure which he had tested and found to work. Later in life he turned more to the social aspects of his specialty and was to be heard addressing the Medico-Legal Society and regional medical societies on the problems of fertility, sterility and contraception, on medical confidence in relation to suspected criminal abortion, and on divorce in relation to venereal disease. His reputation abroad earned him the invitation to preside over the section of obstetrics and gynæcology at the XV International Medical Congress held at Lisbon.

Medical News

Royal College of Surgeons of England

At a meeting of the council held on April 17, with Sir Hugh Lett, the president, in the chair, the Walker prize for cancer research was awarded to Dr. Peyton Rous of the Rockefeller Institute, New York, for his discovery and systematic investigation of filtrable tumours. It was decided to use the bequest from the late Sir Charles Tomes as an endowment for a lectureship on some subject connected with odontology. Mr. H. S. Souttar was re-elected a member of the court of examiners for the ensuing year. Mrs. Antoinette Pirie, Ph.D., was appointed a Leverhulme scholar to work in the laboratories of the Imperial Cancer Research Fund on the effect of the spreading factor on the reaction between tumour viruses and the cells which they infect and in which they multiply. The Cartwright prize for 1936–40 was not awarded. The subject for essays for the years 1941–45 is the replacement of lost tissues following injuries of the jaws.

Dr. J. W. Walker, of Holmes Chapel, Cheshire, and Dr. T. H. Butler, of Hampton-in-Arden, Warwickshire, were elected fellows under the charter which permits the council to elect annually to the fellowship, without examination, two members of twenty years' standing.

It was decided that in the forthcoming primary and final examinations for the fellowship the papers may be written alternatively in Manchester or London and the viva voce will be in London only. There will be no final examination for the fellowship in February 1942. Diplomas of membership were granted to G. C. Purslow, Birm., and J. R. J. Winter, Camb. and St. Barts. Diplomas in child health were granted, jointly with the Royal College of Physicians, to the following:—

C. L. Davidson, Mary G. Tate, Brenda M. Jones, H. W. Bradford, Beryl E. Barsby, J. J. Linehan, G. P. McLaughlan, Margaret E. M. McLaughlin and F. C. Oliphant.

Scottish Conjoint Board

The following having passed the final examinations of the board were admitted licentiates of the Royal Colleges of Physicians and Surgeons of Edinburgh, and the Royal Faculty of Physicians and Surgeons of Glasgow:—

Abduragien Abrahams, M. S. Annett, Jadoonanun Bhageerutty, J. W. Bringan, L. G. Christopher, H. O. Engel, A. W. Paterson, E. C. Richardson, Hyman Sandler, Benjamin Schaefer, J. M. Sherriff, Anthony Shields, R. J. G. Sinclair, W. J. Y. Speedy, W. F. Vancrosson, J. H. Wakely, William Waterston, O. M. Watt, G. A. Y. West, J. P. Weise, V. G. Whelan and J. M. Yablonowitz.

The following graduates of recognised universities were also admitted licentiates of the colleges and faculty:—

Stephen Frank, M.D. Vienna; Margarete J. Hildebrand, M.D. Berne; Tewel Horowitz, M.D. Vienna; Liselotte Lennhoff, M.D. Düsseldorf; Kate Maunsell, M.D. Kiel; Oscar Olbrich, M.D. Prague; and E. R. Schuster, M.D. Giessen.

Since publication of the last list of subscriptions to the Medical War Relief Fund over £900 has been received, bringing the total to over £22,000.

Major-General H. P. W. BARROW, late R.A.M.C., has been appointed colonel commandant R.A.M.C. in succession to Major-General R. S. Hannay who is retiring.

University of Glasgow

On April 19 the following degrees were conferred :—

M.D.—Margaret D. Crawford and A. C. Lendrum (with honours); R. S. Barclay (with high commendation); D. C. Dewar, Alexander Hutchison, J. S. McGregor, James McIntosh and *I. M. Scott (with commendation); and *J. C. Hogarth, *J. E. McClemont, *J. L. Rennie and *A. M. Spence.

M.B., Ch.B.—R. L. T. Hill (with commendation); James Alexander, Anthony Bancewicz, W. G. Barrie, Peter Barron, A. S. Biggart, J. D. Blair, Agnes M. Brogan, J. T. S. Brown, May M. Brown, R. J. Cairns, William Chambers, Christina C. Christie, W. M. Crawford, D. C. Devine, W. D. W. Dick, A. B. Donald, J. M. Glennie, Andrew Gordon, W. M. Gregor, H. R. C. Hay, A. L. Henderson, H. D. Hewitt, Catherine T. Howat, A. S. Hunter, Frances M. J. Hutchinson, Alexander Jamieson, Mary C. Kilpatrick, Dorothy A. Knox, J. D. Laurie, M. B. Leitch, John Lockie, Terence McCarroll, I. R. McCaul, R. O. O. McCrone, H. M. Macfie, James Mackechnie, S. Y. MacKechnie, Alexander MacLachlan, L. G. MacLachlan, Archibald McLaren, Christina R. C. MacLean, Neil McLean, Pearl A. I. MacLeod, I. F. MacMath, A. H. Miller, A. G. B. Miller, D. G. Munro, A. A. Murray, A. F. Nelson, J. A. Ogilvy, William Rankin, F. C. Rodger, Thomas Sergeant, Maurice Shafar, A. H. Smith, Solomon Soldberg, William Steele, J. S. Stevenson, W. J. Barclay Templeton, Eleanor Tennant, Janet Waugh, J. B. de V. Weir, G. D. Wilson and David Wright.

* In absentia.

Bellahouston medals, for eminent merit in M.D. theses, were awarded to Dr. Theodore Crawford, Dr. A. S. Rogen and Dr. A. T. M. Wilson.

A meeting of the Shaftesbury Military Hospital Medical Society will be held on Tuesday, April 29, at 3 P.M., when Prof. J. A. Nixon will give an address on the treatment of serious gas casualties.

A clinical meeting of the Paddington Medical Society will be held on Tuesday, April 29, at 3 P.M. at the Paddington Hospital (L.C.C.), Harrow Road, W.9.

On Monday, April 28, at 2.30 P.M. the section of odontology of the Royal Society of Medicine will meet. Mr. Edgar Manley will speak on the early effect of various filling materials on the human pulp, and Mrs. Shirley Hughes will show a film of the development of rodent teeth. On April 29, at 4.30 P.M., Surgeon Captain Desmond Curran, Wing-Commander R. D. Gillespie, Colonel J. R. Rees and Dr. Eliot Slater will open a discussion at the section of psychiatry on the possibility of predicting breakdown under Service conditions. On May 9, at 10.30 A.M., at the combined annual general meeting of the sections of otology and laryngology Colonel L. E. H. Whitby, Dr. H. F. Brewer, Mr. J. Angell James and Mr. N. A. Jory will open a discussion on chemotherapy, serotherapy and hæmotherapy in otology and laryngology. The section of anæsthetics will hold its annual meeting at 2.30 P.M. on the same day, when short papers will be read.

Five Honyman Gillespie lectures will be held at the Royal Infirmary, Edinburgh, beginning on May 8 at 4.30 P.M., when Dr. Robert McWhirter will speak on progress in the treatment of malignant disease. Other lecturers will be: Mr. Bruce Dick, surgical aspect of diseases of the chest (May 14); Dr. G. Ewart Martin, the value of tracheobronchoscopy and œsophagoscopy in diagnosis and treatment (May 29); Lieut.-Colonel W.F. Harvey, simplification of blood examination (June 5); and Prof. Sydney Smith, wounds from firearms (June 12). The lectures are open to graduates and senior students.

The Ministry of Food recognises that members of the national milk scheme, children receiving milk in schools, and patients in hospitals and nursing-homes have a prior claim on our milk-supplies, and the Sale of Milk (Restriction) order which came into force on April 13 will not apply to them. In private households where an invalid requires extra milk for a short period the Ministry believes that the adult and able-bodied members will be willing to give some of their share of milk to the invalid. But the special diets committee of the Medical Research Council have advised the Ministry that special provision will be necessary in the following serious illnesses where an ample milk diet is essential: tuberculosis; silicosis; condition where the patient is unable to swallow solid food because of an affection of the mouth, throat or gullet; gastric, duodenal or anastomotic ulcer; high and prolonged fevers; and after major operations. Patients suffering from any of these conditions may on a medical certificate obtain a daily supply of milk up to a maximum of two pints at the ordinary current price.

In the report on "Students in Conference" (*Lancet*, April 12, p. 489) Dr. H. G. Stead should have been described as education officer for the Borough of Chesterfield.

THE CHIROPODY GROUP COUNCIL

A recent report of proceedings against a chiropodist (*Lancet*, April 12, p. 490) mentioned that the defendant stated that he was a fellow of the Council of Chiropodists. The Board of Registration of Medical Auxiliaries has asked us to publish the fact that this council is not to be confused with the Chiropody Group Council which is the qualifying body for chiropodists admitted to its National Register. "Chiropodists registered with the board have the confidence of the medical profession and have, in point of fact, been recognised by the Army authorities for enlistment in the R.A.M.C. and the A.T.S.; local authorities, hospitals, &c. also are guided by the board's register in the matter of appointment of chiropodists."

TRAINING HELPERS

LAST summer informal evening classes were arranged at the department of education of the University of Durham for women who wanted to look after young children in the shelters and rest-centres. The classes were organised by Prof. Brian Stanley with the help of Miss M. B. Atkinson, one of his lecturers, and Dr. Gertrude Hickling, who is medical officer to most of the Tyneside nursery-schools. The venture sprang from a real need and was successful—many of the pupils said they had learned what a lot there was to learn—and further courses were arranged this winter to train what the Ministry of Health has described as the "unskilled labour" needed to help run nursery playrooms in reception areas. Since then women who wish to care for the children of munition-workers have also joined the classes and next term further visits and discussions will be arranged for them. The Newcastle health department gives a course of training to members of its child-care reserve, qualifying them to assist the nurses in charge of day nurseries. The department of education aims rather at training helpers for the teacher in charge of a playroom for children over two.

Births, Marriages and Deaths

BIRTHS

COUCHMAN.—On April 16, at Oxford, the wife of Surgeon Lieutenant J. M. Couchman, R.N.—a daughter.

ROPNER.—On April 13, in Edinburgh, the wife of Captain Richard Ropner, R.A.M.C.—a son.

MARRIAGES

LOCK—NESBITT.—On April 14, at Shamley Green, John Archibald Norman Lock, M.B., surgeon lieutenant, R.N.V.R., to Elizabeth Nesbitt.

MONTGOMERIE—IRVING.—On April 15, at Headington, James Samuel Montgomerie, M.B., lieutenant, R.A.M.C., to Dorothea Bethia Irving.

MURDOCH—WOOLLEY.—On April 12, at Hardingstone, Northants, Robin Murdoch, M.B., major, R.A.M.C., to Nora Beryl Woolley.

DEATHS

FORDE.—In April, by enemy action, William Garfield Forde, L.R.C.P.E., of Harleyford Road, London.

FOSTER.—On April 15, in London, William Bradford Foster, M.B. Lond., captain, R.A.M.C., aged 27.

GRIFFITH.—In April, by enemy action in London, Frederick Griffith, M.B. Lpool, D.P.H.

KILROY.—On April 20, at Bradfield, Berks, Lancelot Kilroy, M.R.C.S., D.P.H., surgeon captain, R.N.

LAIRD.—On April 19, at Ormskirk, Charles William Laird, M.D. Dubl., D.P.H., consultant tuberculosis officer, Lancashire County Council, aged 61.

ROWELL.—On April 15, at Carlisle, George Leslie Fisher Rowell, M.D. Camb., of Chapel Street, Belgrave Square, S.W.1, aged 40.

SCOTT.—In April, by enemy action in London, Dr. W. McD. Scott.

STONE.—On April 15, Dudley Macaulay Stone, M.R.C.S., of Harley Street, W.1.

WOODMAN.—On April 15, at Llandudno, Gordon Stewart Woodman, M.B. Durh., F.R.C.S.E. formerly of Bagdad.

Appointments

BROWN, GEORGE, M.B. Edin., F.R.C.S.E.: medical superintendent at Hope Hospital, Salford.

BURN, J. L., M.D., B.Hy. Durh., D.P.H.: M.O.H. for Salford.

CAMERON, D. H. W., M.B. Glasg.: medical superintendent at Alton Hospital, Hants.

FORGIE, A. D., M.B. Aberd.: temp. deputy M.O.H. for Willesden.

JACKSON, G. A., M.D. Toronto: R.S.O. and orthopædic registrar at the Derbyshire Royal Infirmary, Derby.

KIRCHENBERGER, WERNER, M.D. Prague: ear, nose and throat H.P. at the Derbyshire Royal Infirmary, Derby.

MCINTYRE, C. M., M.B. Glasg.: medical referee under the Workmen's Compensation Act 1925 for Islay, Argyllshire.

STAMP, R. A., M.B. Leeds: R.M.O. at Meanwood Park Hospital, Leeds.

VOGT, MARTHE, M.D. Berlin, Ph.D. Camb.: physiologist and pharmacologist on the research staff of the Pharmaceutical Society.

Notes, Comments and Abstracts

BOILS

VIEWS OF A GENERAL SURGEON

BY HAROLD DODD, Ch.M. Lpool, F.R.C.S.
SURGEON TO KING GEORGE'S HOSPITAL, ILFORD AND ROYAL HOSPITAL, RICHMOND; SURGEON E.M.S.

"BOILS are at present only second to colds in incurability," says a medical authority, and the recent leading article on boils in THE LANCET (1940, **2**, 751) shows that a constructive attitude towards their ætiology, pathology and treatment is still lacking in certain of our profession. This article wound up: "If boils occur after careful attention on these lines" (the local application of fomentations and scrubbing with antiseptics) "it is time enough to try specific remedies. Choice of these will probably be governed by fancy and results by fortune." This is a confession of failure.

Boils are treated by general practitioners, surgeons, dermatologists, clinical pathologists, radiologists, physiotherapeutic specialists and occasionally by physicians. All have an individual outlook on the problem. The purpose of this article is to sketch the attitude of a general surgeon after 19 years of practice. It is hoped to show how a rational plan of treatment leading to consistent cure particularly in the persistent types has been devised from study of the ætiology and pathology of boils. Single occasional boils are seldom referred to the surgeon.

ÆTIOLOGY AND PATHOLOGY

The ætiology of boils—and of carbuncles and breast abscesses after lactation—depends on the fact that the patient's vital resources are insufficient to resist the organisms, commonly staphylococci, which are always about. These resources are built up by a balanced diet and are expended by physical, mental and spiritual activities and by detoxication services, especially for septic foci in teeth, sinuses, appendix and particularly tonsils. Defective nutrition, overwork, worries and moral failure all play a part. Thus boils are a local manifestation of an exhaustion of constitutional vigour. In the war of 1914–18 boils were common, food was defective, work and worry were heavy, and a debit balance in vital energy was created.

Some people get boils and pustules on the back of the neck when they are run down, and a long week-end's rest checks them. Oarsmen develop boils when they are overtrained and stale. Diabetics are subjects whose health is easily brought below par and in whom furunculosis and carbuncles readily occur; which is a reason for always testing the urine in pyogenic conditions. In domestic, industrial and professional patients the cause is to be found in a defective diet, exhaustion or septic foci. Two balloon-barrage men, lately treated, stated that for over a year they had "worked twenty-five hours a day for eight days a week and for thirteen months a year." One had boils and the other a carbuncle; both were in the early twenties; the exhaustion factor was the exciting cause.

A staphylococcal infection stimulates a gross local inflammatory reaction in the skin and subcuticular tissues. This is characterised by much œdema, induration and thrombosis of the adjacent veins, capillaries and lymphatics, and produces a large brawny, cyanosed swelling. The blood-supply is deficient in the central area and hence the sloughing. The staphylococcus exerts a lytic reaction on the skin and subcutaneous tissue, so that drainage is self-made. This course is ideal, spread elsewhere is arrested and drainage is assured. Treatment is obvious: leave the lesions alone and relieve the pain by rest and sedatives.

ACCEPTED METHODS OF TREATMENT

It will be argued that to stick a knife in the boil will relieve the tension and thereby the pain, and will accelerate resolution by avoiding the depressive action of sedatives. This may be so in the hands of the specially skilled and experienced; but so often the jabbing with a scalpel and curetting is anything but skilled, and the procedure breaks down the natural defences and invites a train of harmful procedures in the shape of squeezing' bathing and fomentations.

The conventional response to a boil is to say "It isn't much, carry on"; while the local remedies are poultices, fomentations, suction bells, squeezing until the "core" is out, or incision and curetting. All these run counter to the ætiological and pathological factors. They encourage the detachment of thrombi (often infected with virulent staphylococci) and the breakdown of the protective barrier; thus daughter boils develop in the adjoining skin and—more rarely—abscesses form in the kidneys, the ischio-rectal fossæ or in bones. The general features of diet and of septic foci are not corrected. Recurrent boils are probably pyæmic in nature and caused by traumatising management; recurrence is generally attributed to external infection of the hair follicles in the surrounding skin, but this mode of spread is probably negligible. This opinion is based on the fact that I have never seen recurrence after treatment of boils and carbuncles with a wet dressing of sodium sulphate solution, left unchanged for at least 48 hours where the area is macerated in pus, and that boils seldom develop under elastic plaster or plaster-of-paris covering an acute suppurative varicose ulcer or osteomyelitis sinus when the whole part has been bathed in pus for several days and weeks. The same is true of infected compound fractures. Admittedly, multiple tiny pustules often develop, but these are superficial, never the deep-seated lesion which is characteristic of a boil. When boils are squeezed infected thrombi are likely to break off and float away to lodge in the large adjacent subcuticular venous plexus, and daughter boils probably develop from these.

Yeast, tin, manganese, vaccines and toxoid have all been used in the treatment of boils. They all stimulate a leucocytosis or act as antiseptics, but how can they restore health to a tired body, evacuate a septic focus or stop infected thrombi detaching themselves from repeatedly squeezed boils? Curative remedies must include steps to restore the general health and splint adequately the affected region, besides local antiseptics. The leading article already quoted advised that "patients should scrub the affected area with soap and water and antiseptic lotion three times a day till at least a month after the last boil has gone." This instruction seems calculated to stimulate a recurrence by steadily injuring the part and provoking a chemical dermatitis. Even if it were sound in principle, few patients would do it. Baths were suggested for widespread boils. The movements necessary for soaking in an antiseptic bath will encourage the break-off of infected thrombi, and the moist heat will dilate the superficial vessels, which will assist the distribution of these detached particles and ensure recurrences. Moreover, baths need sterilising after such a contamination. Patients with widespread boils must stay in bed, not getting up even for toilet purposes, but giving the lesions maximum rest and applying all their energy to healing.

Septic foci should be sought diligently because they may be the only factor which is keeping the health subnormal. It seems probable that the organisms overflow into the circulation from time to time.

CASE 1.—A doctor's daughter had had 23 boils in a year. She was treated first by her father, then by a dermatologist, a pathologist and finally by a physician. The condition continued. Her tonsils looked normal but the tonsillar glands were enlarged and her complexion was pustular and blotchy, so the tonsils were dissected out. Another boil started two days after the operation but aborted, and no further trouble has been experienced; her complexion also has improved.

Occlusion of a boil with elastic plaster is often successful because it splints the part and discourages squeezing to extrude the slough. Laymen and professional nurses are avid to evacuate the core of a boil. This is the "high spot" in the attendance.

X rays do nothing to restore the general health, nor to splint the part or eliminate a septic focus. Visits to X-ray departments disturb splinting and rest. Radiotherapy stimulates the vital activity of the body and of the affected part in particular, but it is rest that both need. Fomentations may scald and so further devitalise the part. They require frequent changes, each one of which gives the opportunity for wiping and pressing. The same applies to hot bathing and suction bells.

TREATMENT RECOMMENDED

A liberal balanced diet of well-cooked fresh fruits, vegetables and meat should be ordered. If there is evidence of vitamin deficiency, preparations of A, B, C and D are given. Cakes, sweets, chocolates jams and tinned foods are eliminated as far as possible from the menu; patients do better on a low-carbohydrate diet. While the boils are in being a generous fluid intake is essential; at least 6–7 pints a day are needed, enough to cause the patient to pass 100 oz. of urine a day. Tap water and fruit drinks are tolerated best. Patients are put to bed and given sodium barbitone gr. 7–10 nightly; this ensures dreamless sleep. Morphia or codeine may be necessary for the pain before drainage starts.

CASE 2.—A bank cashier developed a large boil on the back of his neck. For over a year he had cycled more than 30 miles a day to his work: the hours being 9 A.M. to 10 P.M. He had a family of five children and was anxious to pay off the mortgage of his house. This is an example of complete physical exhaustion.

It will be advanced that to put a man or woman "off" work particularly in war-time is unnecessary and will slow down the national effort. If fatigue is an exciting factor, then if these patients remain at work it will be found that they are accident and error prone, and that a timely rest is economically sound practice in the long-run.

Septic foci are sought for and dealt with early. The teeth are radiographed. The signs of septic tonsils are a patchy pustular complexion, inflamed tonsils (usually large, but sometimes small and hidden behind deeply injected pillars of the fauces), tonsils containing encysted abscesses, or tonsils apparently normal but associated with palpable glands at the angles of the jaw and at the bifurcation of the common carotid. The digestive system is investigated for signs of appendicular or gall-bladder sepsis, and the pelvis is always investigated in the female.

CASE 3.—A woman doctor with a large practice fell ill and a succession of boils culminated in her retirement. The boils continued to appear a year later, in spite of treatment. Her tonsils looked normal, but the tonsillar glands were continuously enlarged; tonsillectomy was performed, when the boils stopped.

When debility is apparently the main causative factor, a blood-count is done. This sometimes reveals an unexpected anæmia. If the hæmoglobin is below 85% a transfusion is given to supply a general fillip. When the patient is extremely debilitated injections of suprarenal cortex, 1 c.cm., are given daily intravenously or intramuscularly for 7–14 days.

Local applications consist of large compresses saturated in 12% sodium sulphate, a piece of jaconet to cover this, a huge pad of wool, and a rubber hot-water bottle or an electrically heated pad which is controllable by the patient. The whole is firmly applied and constitutes a moist splint. The compress is kept damp by dripping sodium sulphate from an anæsthetic dropping bottle down the edge of the dressing three times a day. The compress is changed only on alternative days, squeezing is prohibited, and the part is merely socially cleansed.

CASE 4.—A doctor had repeated boils on his hands and forearm. He refused a long week-end in bed, but a month later another boil with surrounding cellulitis appeared. He was warded and the forearm was fixed to a splint and the whole limb to a large soft pillow. He observed "this arrangement is very comfortable but I can scarcely move the rest of my body." This was the intention of the arrangement. Seven days in bed finally arrested his failure to resist staphylococci.

The whole limb is splinted; it relieves pain and enforces rest of the entire body. Fingers in particular are fixed by splints reaching as far as the elbow-joint, with the splints sticking out beyond the nails to ensure complete fixation.

CASE 5.—A Czech refugee had an exhausting experience getting to England by way of the Balkan States, North Africa and a tramp steamer, a journey which lasted over six months. On arrival in England a crop of boils began and continued for many weeks. Assistance was requested because they developed on her fingers and prevented her doing her personal duties and housework. She was put to bed for a week and the hands were splinted, the dressing being changed only once in this period; she protested vigorously against this, as she felt she was having no treatment, but at the end of ten days the boils had healed; so far as I know they have not recurred.

Boils and carbuncles on the back of the neck and shoulders are immobilised by fixation on a back-splint with a foot-piece. The foot-piece rests on the head and the leg-piece lies behind, the head, neck and scapulæ being secured by bands around the forehead, neck and chest. Patients with boils on the back are nursed on their face, and, if in a hospital ward, the patient is turned round with his head to the foot of the bed so that he can see what is going on. A large padded dressing and hot-water bottle are held to the lesion by a many-tailed bandage. Sleeping on the face gives maximum relaxation and is a habit soon acquired.

A voluminous dressing is put on to perineal boils. The prone position may be the most comfortable. The diagnosis from anal or rectal suppuration must be made, for these conditions call for specialised surgical treatment. The diet is limited to drinks (all sorts) amounting to at least 6–7 pints a day so that the bowels are confined for a week. This is easily borne by the patient; no serious hardship has been experienced from this deliberate constipation.

With a view to stimulating the activity of the leucocytes, Lord Horder's remedy is given: sodium cacodylate gr. 1–3, and sodium nucleinate (saturated solution) ℥20 intramuscularly twice on the first day and thereafter daily for 6 doses.

In over 10 years of surgical practice I have opened no boils or carbuncles surgically. Recovery has been uncomplicated and healing usually inconspicuous, even with carbuncles as large as a saucer. A possible objection to this regime is that patients "won't stand for it." The reply is that you feel no concern over the boil in question; it will get better no matter what is done: but that it is your responsibility to protect the patient from a crop of boils or from the chance of developing a perinephric abscess, osteomyelitis or an ischiorectal abscess.

CARE FOR THE RAIDED

GENERATIONS to come will wonder how it came about that elaborate plans were made to deal with the killed and wounded in this war, but that almost nothing was done to meet the needs of those who might be merely deprived of food and shelter. Mr. Ritchie Calder, in "The Lesson of London" (Secker and Warburg, London, 2*s*.), has performed a notable service to the history not only of the war, but of social institutions in this country by reporting with his usual vividness and accuracy the effects of bombing on our cities; and he has indicated some of the lessons to be learnt from this experience. Auxiliary fire services had long been organised, but it did not seem to have occurred to anyone that if many fires broke out there might be some shortage of accommodation for the inhabitants of the cities. Perhaps it was hoped that evacuation would solve this problem, but it became clear early in 1940 that there would be no large-scale exodus, and that many of those who had left London in the first few weeks had returned and settled down in their old quarters. No-one, it seemed, had contemplated that air-raid shelters would be needed night after night, and so should be fitted with sleeping equipment and canteens. It was not even thought necessary to equip them with sanitary arrangements, much less to provide medical or nursing services for the shelterers. Those who could afford to do so had made admirable preparations—many private people and large firms had built excellent refuges, warm, well-lit, supplied with filtered air, offering safe and comfortable accommodation. The authorities had pinned their faith to the Anderson shelter, and discouraged those municipalities, such as Finsbury, which proposed to provide bomb-proof refuges. Perhaps it was well that the calamity, when it came, was so swift and overwhelming that the victims were allowed, without much opposition, to take things into their own hands; they swarmed into warehouses, cellars, and the underground railways, carrying their blankets and few personal effects, and settled down. Calder gives some graphic descriptions of those days in early September, with authority baffled and helpless in face of a huge problem; with priests and

social workers grappling manfully with the perplexities and distresses of their people; with magnificent efforts by voluntary organisations and private firms to meet the most urgent needs; and finally with the recognition by the Government of grave mistakes and miscalculations, and the gradual evolution of some kind of order and efficiency in the arrangements for relieving victims of the raids.

The medical profession cannot, in Calder's opinion, claim to have shown conspicuous success in meeting the demands of the situation. The appallingly insanitary conditions of some of the large communal shelters, and the almost universal overcrowding and absence of facilities for proper cleanliness, made it likely that epidemics of influenza, cerebrospinal fever and lice-borne diseases would take a heavy toll; in fact, as we know, there was surprisingly little infection. There was, however, difficulty and delay in organising medical services for the shelter population, and Calder makes some pointed comments on the need for an extension of a salaried service under state control. He also describes the unenviable lot of the private practitioner who sees his patients melting away and the whole basis of his economy breaking up. However, he gives generous praise to those who were called on, a few weeks later, to cope with the wreck of Coventry, and who showed, by their masterly handling of that difficult situation, that the agony of London had taught them something of how to meet such an emergency. The book closes with a chapter packed with suggestions for social planning, arising out of experience of these disasters. It seems clear that the basis of local government will have to be drastically revised, that regional councils have come to stay, communal kitchens have proved their value, and the dispersal of urban populations into the country has brought about changes in the health and outlook of the younger generation which will have far-reaching consequences.

Perhaps the brightest picture which emerges from all this welter of damage and distress is that of the unconquerable courage and faith of the ordinary man and woman, the spirit of comradeship, of give-and-take, of adaptation to new conditions, and the growing demand for a new social order which shall offer comfort and security after victory has been achieved.

A RURAL SCHOOL CANTEEN

Mr. John Audric, headmaster of Brockham Green School, Surrey, writes: During last October I watched with anxiety the faces of the 300 children of this school, wondering how they were standing up to a long series of disturbed nights when their sleep was interrupted by gun-fire and bombs. Danger did not seem to affect them so much as noise, but the bad effect of lack of sleep on their health was shown in their faces. I set out to find how some of the evil might be repaired. Hot drinks and biscuits were given during the morning interval, and again at lunch when about 100 children whose homes were too far from school to permit of a return journey brought their food with them. Under normal conditions beef-tea and soups might have served as a stay-over, but times were not normal and the children's constitutions were menaced from nights spent in shelters which, owing to the nature of the locality, were damp. There was also the possible danger of infectious diseases spreading in this overcrowded rural area. It should be noted here that the medical authorities had taken due note of this danger, and had done splendid work in their inoculation for diphtheria immunisation, which was gratefully accepted by the parents for their children.

Accordingly, a more ambitious scheme was brought out. This was the opening of a school canteen which would provide a hot meal of two courses for all children who required it. The meal had to be cheap, so that it could be well within the reach of the pockets of the poorest parent, and it had to be well balanced. The price of the complete meal was fixed at 3*d*., and care was taken to see that the food was varied. Help was immediately forthcoming. The local-education authority supplied free of all charge, cups, knives, forks, spoons and plates. The matron of a nearby institution placed her kitchen, her catering knowledge, and all her services at our disposal. Labour was free and given generously. In order to keep the price down to this very low figure, more ground was cultivated in the school-gardens, and the produce used in the canteen. For six months now the meals have been maintained in price, quality and quantity, and spring has added the extra attraction of flowers from the school-gardens for the dining-tables. With the warmer weather ahead the gardens will make the work of building up a well-balanced diet less difficult.

The cold facts of statistics are illuminating. Never before in the history of the school has the attendance been so high; never before has the school been so free from infectious diseases. The hot meal has strengthened the children's power of resistance. The standard of work has also improved, and it has been found that children have tackled the afternoon's lessons with renewed vigour. Education and medical authorities are encouraging the adoption of school canteens with infectious enthusiasm, and are giving most generous practical help. In spite of the increased work which has fallen on the shoulders of teachers, they will not fail to support them in this work.

MEMORIAL TO R. FORTESCUE FOX

Dr. Fortescue Fox was for 43 years connected with the Lebanon Hospital for Mental Diseases at Beirut, and for 16 years he was its chairman in London. Now, ten months after his death, comes the suggestion from Beirut that there should be some memorial to their friend at the hospital. Hydrology is the one form of treatment which is still lacking there, and it is proposed to build and equip a small department, costing about £750, which will be called the Fortescue Fox medical baths. This memorial would link hydrology and physical medicine—one of the major concerns of Dr. Fox's life—with an institution which he loved and served. Donations should be sent to Miss Hilda Fox, who is secretary of the hospital, at Elms Farm House, Pett, near Hastings. The money will be invested in national funds until building can be begun.

STORAGE OF ANTITOXINS

In a paper presented at the British Pharmaceutical Conference on April 16 Mr. G. E. Shaw, B.Sc. and Mr. H. G. Hind, Ph.D. (Evans Biological Institute) discussed the storage of antitoxins during war-time. Antitoxin is stored in a sterile condition at about 4° C. in large glass containers. Bombing presents a grave risk to bulk storage because containers may break and the supply of electricity to the refrigerator plant may be interrupted. The speakers have been seeking a method which would eliminate the need for glass containers and make the use of refrigeration unnecessary, while at the same time preserving the potency and sterility of the product. They suggest either reducing the serum to powder by desiccation, or drying an intermediate precipitate produced during the manufacture of concentrated serum. By either method the dry powder can be stored in any kind of container without refrigeration; its potency is maintained and the powder is self sterile.

NEW PREPARATIONS

WELLCOME BRAND ANTI-TYPHOID-PARATYPHOID VACCINE with TETANUS TOXOID (T.A.B.T.) is issued in 1 c.cm. sets of two doses, sufficient for one immunising course. The first dose of 1 c.cm. tetanus toxoid contains 500 million *Bacterium typhosum*; 375 million *Bact. paratyphosum* A; and 375 million *Bact. paratyphosum* B. The second dose of 1 c.cm. tetanus toxoid contains 1000 million *Bact. typhosum*; 750 million *Bact. paratyphosum* A; and 750 million *Bact. paratyphosum* B. It is also available in rubber-capped bottles of 25 c.cm. of dose 1, and rubber-capped bottles of 25 c.cm. of dose 2.

WELLCOME BRAND ANTI-TYPHOID-PARATYPHOID A, B and C VACCINE (T.P.3) is prepared from smooth virulent strains and contains 1000 million *Bacterium typhosum*, and 750 million each of *Bact. paratyphosum* A, B and C per c.cm. It is administered subcutaneously; either two doses of 0·5 c.cm. and 1 c.cm., or three doses of 0·1 c.cm., 0·5 c.cm. and 0·75 c.cm. are usually given at intervals of 7–10 days. The former dosage has been recommended by the Army authorities; the latter has been much used in civilian practice and is associated with somewhat less severe reactions. In an epidemic a first dose of 0·1 c.cm. has been recommended. The vaccine is issued in special containers of 1·5 c.cm.—sufficient for one immunising course—and in bottles of 25 c.cm.